8081

Delivery Order No. 6
Total Environmental
Program Support
Contract #
DAAM01-94-D-0020

U.S. Army
Environmental
Center

FINAL

ENHANCED PRELIMINARY ASSESSMENT SCREENING

INITIAL LAND TRANSFER TO U.S. DEPARTMENT OF AGRICULTURE

JOLIET ARMY AMMUNITION PLANT WILL COUNTY, ILLINOIS

Volume 1 of 2

Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
Aberdeen Proving Ground, Maryland 21010-5401

Unlimited Distribution
Approved for Public Release

October 1996

PLEXUS SCIENTIFIC CORPORATION

Enhanced Preliminary Assessment Screening for
Initial Land Transfer to
U.S. Department of Agriculture

Joliet Army Ammunition Plant
Will County, Illinois

Prepared for:

U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401

Philip Rappa III
Project Manager

Geoffrey Carton
Environmental Scientist

Prepared by:

PLEXUS SCIENTIFIC CORPORATION
12501 Prosperity Drive, Suite 401
Silver Spring, Maryland 20904

Delivery Order Number 0006
Total Environmental Program Support
Contract # DAAM01-94-D-0020

October 1996

TABLE OF CONTENTS

Volume 2:

FIGURES

TABLES

LIST OF ACRONYMS

ACM	Asbestos containing material
AEHA	Army Environmental Hygiene Agency (now CHPPM)
AFR	Acid fume recovery
AHERA	Asbestos Hazardous Emergency Response Act
AMCCOM	Army Munitions and Chemical Command
AOP	Ammonia oxidation plant
ARAR	Applicable or relevant and appropriate requirements
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BLU	Bomb live unit
C	Celsius
CBU	Cluster bomb unit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CHPPM	Center for Health Promotion and Preventive Medicine
DDESB	Department of Defense Explosive Safety Board
DMAS	Dimethylanaline sulfate
DNT	Dinitrotoluene
DOD	Department of Defense
DU	Depleted uranium
DWEL	Drinking water equivalent levels
EPIC	Environmental Photographic Interpretation Center
ERNS	Emergency Response Notification System
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FFA	Federal Facility Agreement
FINDS	Facility Index System
FPMR	Federal Property Management Regulations
FS	Feasibility study
ft	Foot
g	Gram
GOCO	Government owned contractor operated
gpd	Gallons per day
gpm	Gallons per minute
HE	High explosive
HMX	High Melting Explosive (cyclotetramethylenetetranitramine)
HRS	Hazard ranking system
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency

I&M	Illinois & Michigan
IOC	Industrial Operations Command
IR	Installation Restoration
IRDMIS	Installation Restoration Data Management Information System
IRP	Installation restoration program
JOAAP	Joliet Army Ammunition Plant
JATA	Joliet Army Training Area
kg	Kilogram
l	liter
LAP	Load-assemble-pack
LQG	Large quantity generator
MCL	Maximum Contaminant Level
MFG	Manufacturing
mg	Milligram
µg	Micrograms
MGD	Million gallons per day
mm	Millimeter
msl	Mean sea level
NAC	Nitric Acid Concentrator
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHC	National Heritage Corridor
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NRC	Nuculear Regulatory Commission
NRDC	Natural Resources Defense Council
NS	Nitroxylenes
OSHA	Occupational Safety and Health Administration
OU	Operable unit
PAS	Preliminary Assessment Screening
PBX	Plastic bonded explosive
PCB	Polychlorinated biphenyl
pCi	Picocurries
ppm	Parts per million
PRG	Preliminary remediation goals
RAATS	RCRA Administrative Action Tracking System
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RDX	Royal demolition explosive (hexahydro-1,3,5-trinitro-1,3,5-triazine)
RI	Remedial investigation
RME	Reasonable Maximum Exposure
RQ	Reportable quantity

RU	Remedial unit
SAR	Sulfuric acid regeneration
SARA	Superfund Amendments and Reauthorization Act
SMCL	Secondary Maximum Contaminant Level
SOC	Statement of conditions
SPCC	Spill control and countermeasures plan
SQG	Small quantity generator
STP	Sewage treatment plant
TCLP	Toxicity Characteristic Leaching Procedure
TETRYL	Trinitrophenylmethylnitramine
TNT	Trinitrotoluene
TPHC	Total Petroleum Hydrocarbon
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage and Disposal
USACOE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency (now USAEC)
USC	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	Underground storage tank
UXO	Unexploded ordnance

1. INTRODUCTION

A Preliminary Assessment Screening (PAS) for the Joliet Army Ammunition Plant (JOAAP) was initiated by the U.S. Army Environmental Center (USAEC), Aberdeen Proving Ground, Maryland 21010. This PAS evaluates the existing facility and environmental conditions to determine and document whether hazardous or toxic substances were used, released, stored in excess of one year, or disposed within JOAAP.

JOAAP is located near the city of Wilmington, Will County in northeastern Illinois (Figure 1-1). The entire facility is declared excess and land transfer to future owners is directed by Public Law 104-106, Fiscal Year 1996 Department of Defense Authorization Act. The future owners and future land use include: the U.S. Department of Agriculture (USDA) for establishment of a National Tallgrass Prairie; the Department of Veterans Affairs for a Veterans Cemetery; Will County for a landfill; and the State of Illinois for establishment of industrial parks (BILL01).

To develop a PAS for the site, the facility is divided into three separate parcels corresponding to the future owners. These parcels include: 1) USDA, 2) Will County (the "landfill"), and 3) State of Illinois (two non-contiguous industrial areas). The JOAAP facility and three transfer parcels are depicted by future owner in Figure 1-2. For each parcel, a separate PAS report is under development.

This report evaluates portions of the USDA parcel (the "agriculture parcel") appropriate for transfer at this time as identified by the U.S. Environmental Protection Agency (USEPA) (RBOW01). Issues are identified and findings are discussed in Section 4. A summary of findings is presented in Section 5 of this report. Required actions and specific future use restrictions will be presented in a separate Statement of Conditions (SOC). All boundaries and areas discussed or shown in this report should be considered approximate as no land survey has been conducted.

The scope of this project does not include the proposed Veterans Administration Cemetery. A separate PAS report was prepared for the cemetery in March, 1995 (PSCO01). This report is submitted by Plexus Scientific Corporation, 12501 Prosperity Drive, Suite 401, Silver Spring, Maryland 20904 under Contract Number DAAM01-94-D-0020 (Delivery Order #0006).

1.1 Purpose

This PAS complies with the requirements of 40 Code of Federal Regulation (CFR) Part 373 Section 373.1 and Army Regulation 200-1 (Environmental Protection and Enhancement). The provisions of 40 CFR 373 require that a Notice accompany contracts of sale and deeds entered into for the transfer of federal property on which hazardous substances may have been stored, released or disposed. Specifically, Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires a Notice if hazardous substances have been stored for one year or more if quantities exceed either 1,000 kilograms, or the reportable quantity (RQ) for the substances as specified in 40 CFR 302.4, whichever is greater; or 1 kilogram for acutely hazardous waste (as defined in 40 CFR 261.30). A Notice is also required if hazardous substances were disposed of or released on the property in an amount greater than or equal to the RQ. Army Regulation 200-1 (Environmental Protection and Enhancement) requires that a PAS address other potential areas of concern including asbestos, lead based paint, radon and other potentially health-threatening substances.

Development of this PAS includes the following four components: 1) a review of practically obtainable and reasonably ascertainable records; 2) a site survey; 3) interviews with knowledgeable persons; and 4) generation of the PAS report. This PAS identifies and documents the presence or evidence of any hazardous or toxic substances that trigger the Notice requirement of 40 CFR 373 and identifies other areas of potential concern.

1.2 Scope and Limitations

The PAS report identifies, summarizes, and defines, to the extent such information is available, the environmental conditions and concerns of the land, facilities and real property assets for JOAAP agriculture parcel, Will County, Illinois. The findings of this PAS are based upon a records search of several thousand documents, review of over 500 documents and a site reconnaissance of JOAAP conducted between December 4, and December 22, 1995. A complete title search was not conducted. Extensive environmental investigations and reports have been prepared for the JOAAP. These reports and site historical documents were reviewed during the conduct of the PAS and in support of this report. Information obtained from other studies is noted within this PAS by a reference code. A complete list of references and codes is provided in Section 6 of this report. Discrepancies found during document review are identified and reconciled where possible.

Plexus contacted and interviewed personnel familiar with the JOAAP during development of the PAS. Persons contacted include: Tom Erdman, Art Holz, Bob Zerboglio and Nancy Yates (JOAAP Staff); Janet Beavers (USAEC Project Officer); Norman Demarais (former Plant Manager); Bernie Kavanaugh (former Uniroyal Environmental Coordinator); John Csikos (former supervisor for red water, tetryl, and TNT areas); Keith Corbin (former employee); Tim McHale (Alliant Techsystems, Inc.); project managers for other environmental studies at JOAAP (Dames & Moore and OHM Remediation Services Corporation) and the Industrial Operations Command (IOC) historian.

Several environmental studies and investigations are on-going at JOAAP. A summary of these studies is presented in Sections 2.2.4 and 4.1.3.

1.3 Organization of the PAS

This PAS is organized into a number of sections and appendices. Section 1.0 is this introduction. Section 2.0 provides a description of the environmental setting, an overview of plant operation and history and a summary of previous environmental investigations. Section 3.0 describes the approach and method used to conduct the PAS. Section 4.0 summarizes findings organized by environmental factors. Section 5.0 identifies significant findings. A bibliography is provided in Section 6.0.

The report text is organized by environmental issues. The reader may find all relevant information on a particular issue in Section 4. A summary of the findings by environmental issue is presented in Section 5. For example, Section 4.8 presents all of the findings relating to PCBs and Section 5.1.8 provides a brief summary of the significant findings.

The appendices are arranged to allow the reader to determine the full range of environmental issues relating to a specific portion of JOAAP (Appendix B) or an individual building (Appendix C). Appendices B and C were generated from a database developed to manage site information. Additional information concerning the Installation Restoration Program (IRP) sites is presented in Appendix D. Appendix E contains a table to be used to meet the CERCLA 120(h) notice requirements. The following appendices are included in Volume II of this report:

- Appendix A - questionnaire sent to agricultural lessees
- Appendix B - profiles of study sections
- Appendix C - profiles of buildings
- Appendix D - profiles of IRP sites
- Appendix E - chemicals known to have been used, stored, disposed or released.

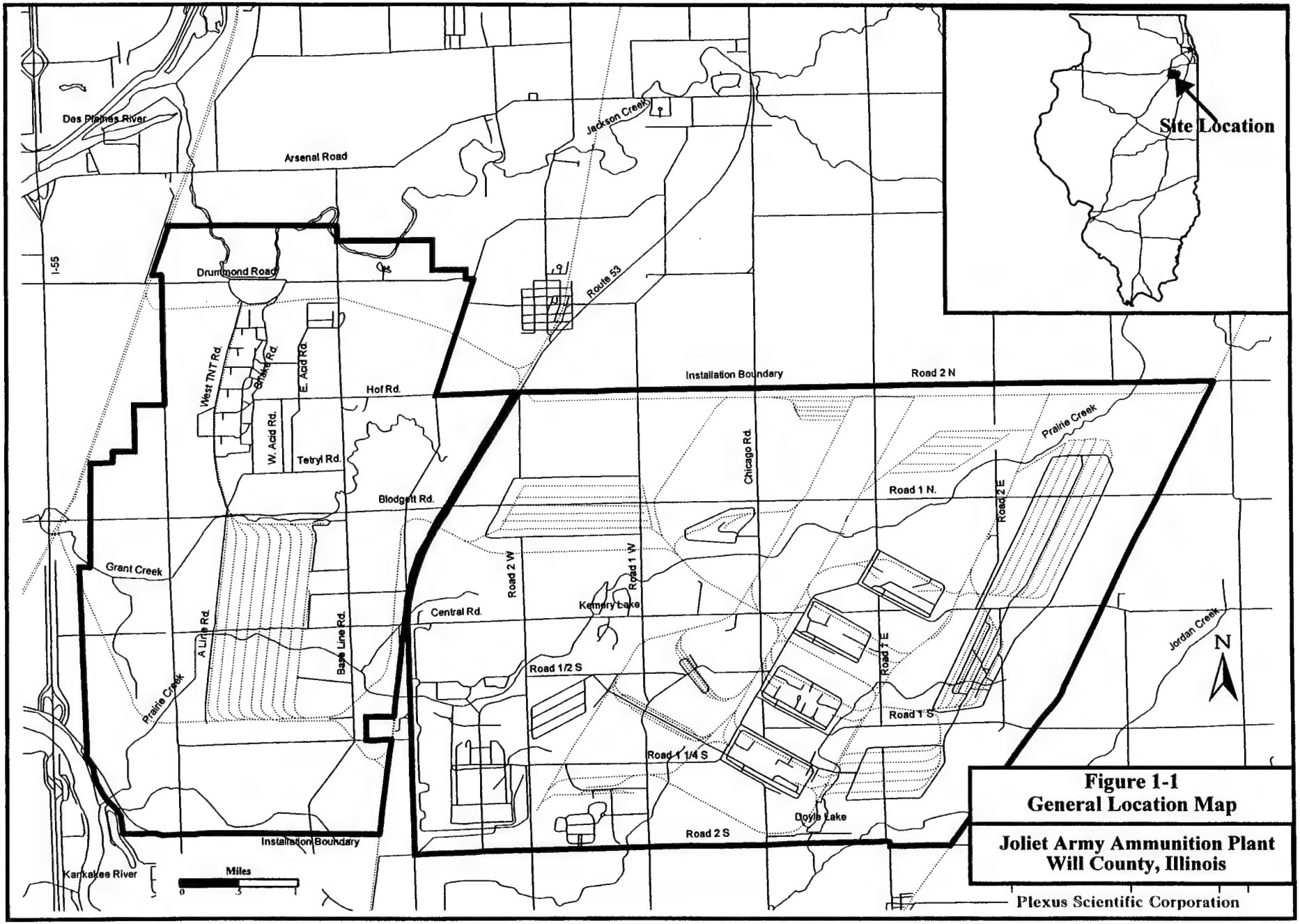
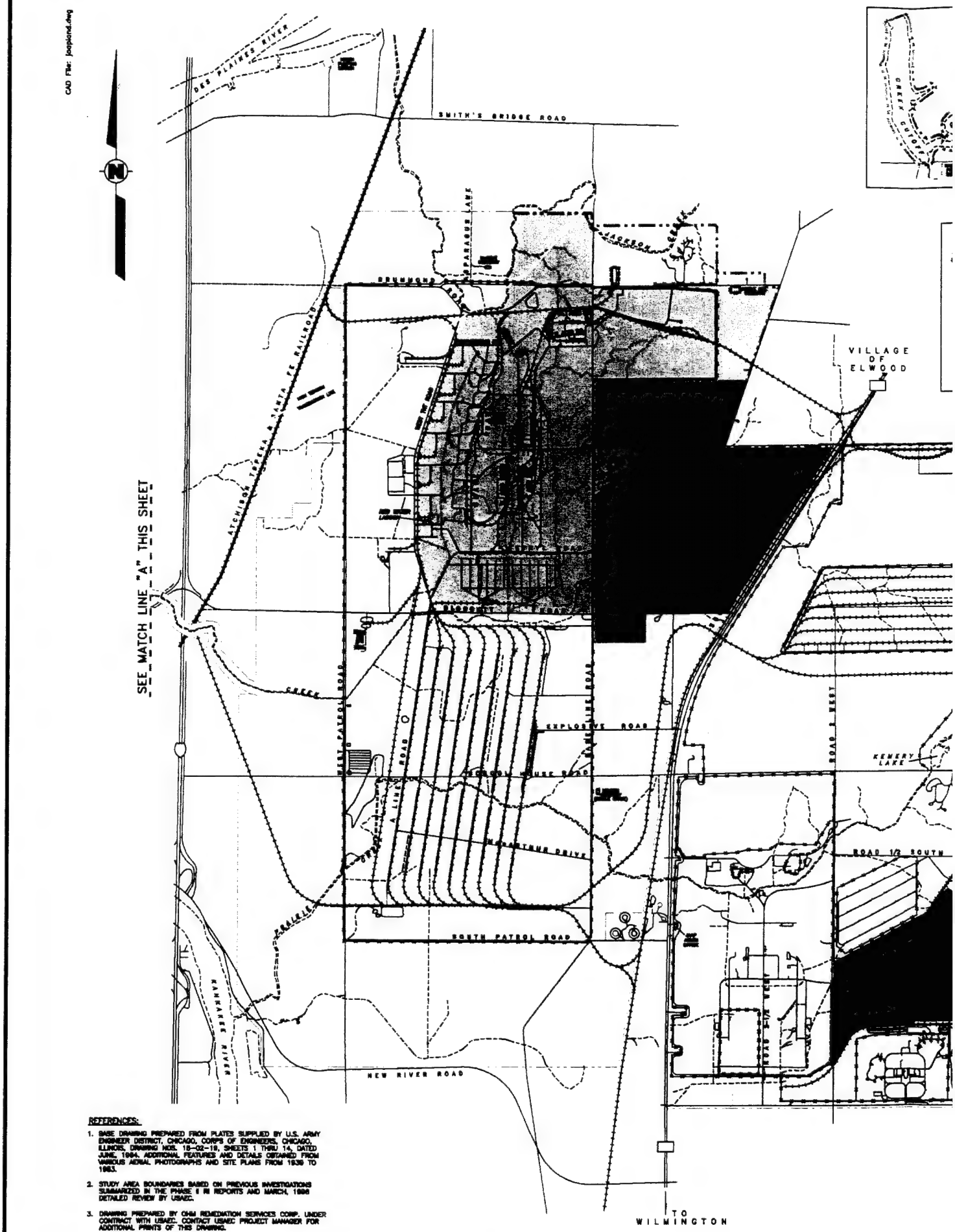


Figure 1-1
General Location Map

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation



REFERENCES:

1. BASE DRAWING PREPARED FROM PLATES SUPPLIED BY U.S. ARMY ENGINEER DISTRICT, CHICAGO, CORPS OF ENGINEERS, CHICAGO, ILLINOIS, DRAWING NOS. 18-02-19, SHEETS 1 THRU 14, DATED JUNE, 1994. ADDITIONAL FEATURES AND DETAILS OBTAINED FROM VARIOUS AERIAL PHOTOGRAPHS AND SITE PLANS FROM 1939 TO 1963.
2. STUDY AREA BOUNDARIES BASED ON PREVIOUS INVESTIGATIONS SUMMARIZED IN THE PHASE I IN REPORTS AND MARCH, 1988 DETAILED REVIEW BY USAEC.
3. DRAWING PREPARED BY OHM REMEDIATION SERVICES CORP. UNDER CONTRACT WITH USAEC. CONTACT USAEC PROJECT MANAGER FOR ADDITIONAL PRINTS OF THIS DRAWING.
4. THE RIVER PUMP STATIONS WILL BECOME PART OF THE INDUSTRIAL PARKS.

Figure 1-2
Land Use Pl

Joliet Army Ammunit
Will County, Illin

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

PLEXUS scientific

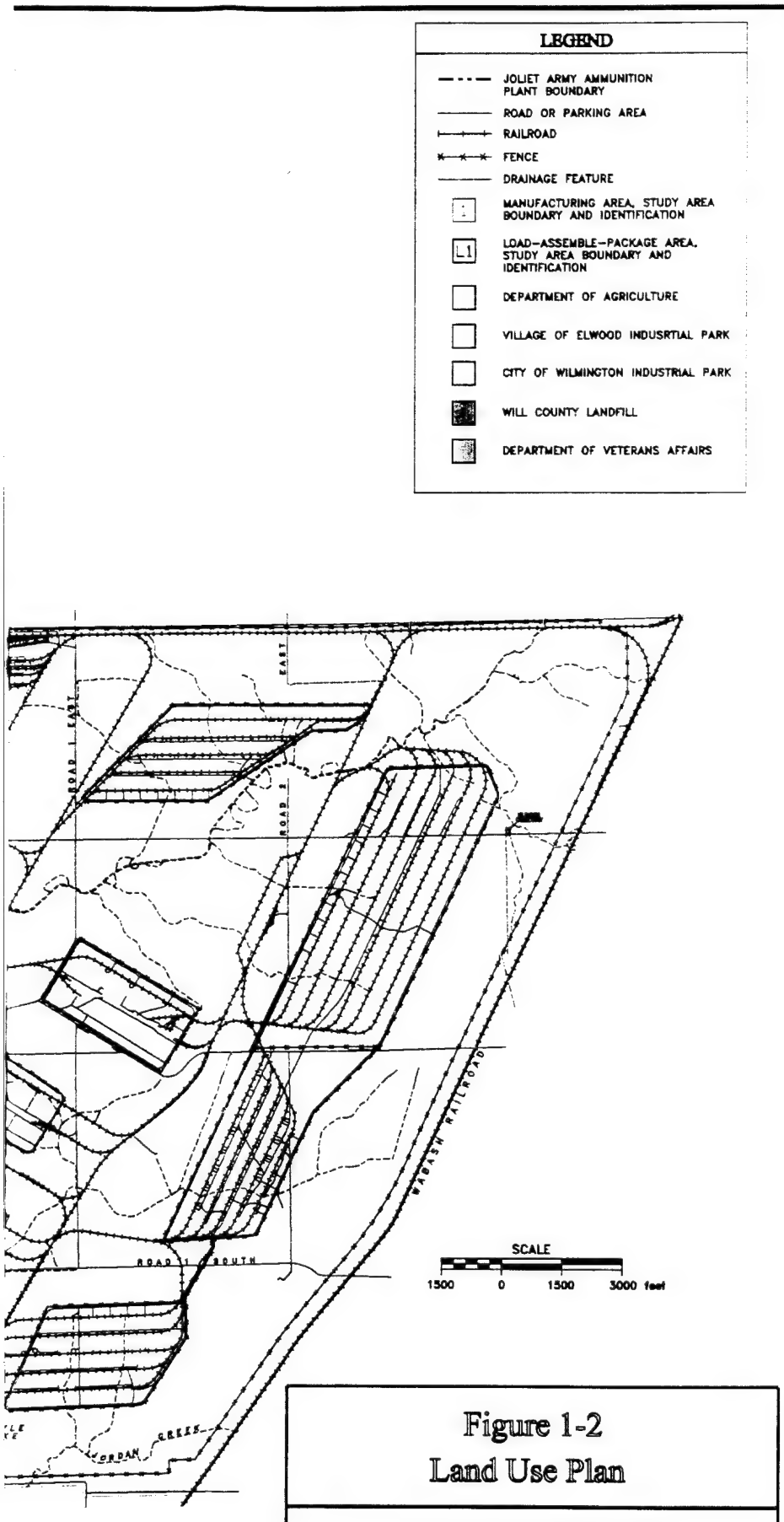
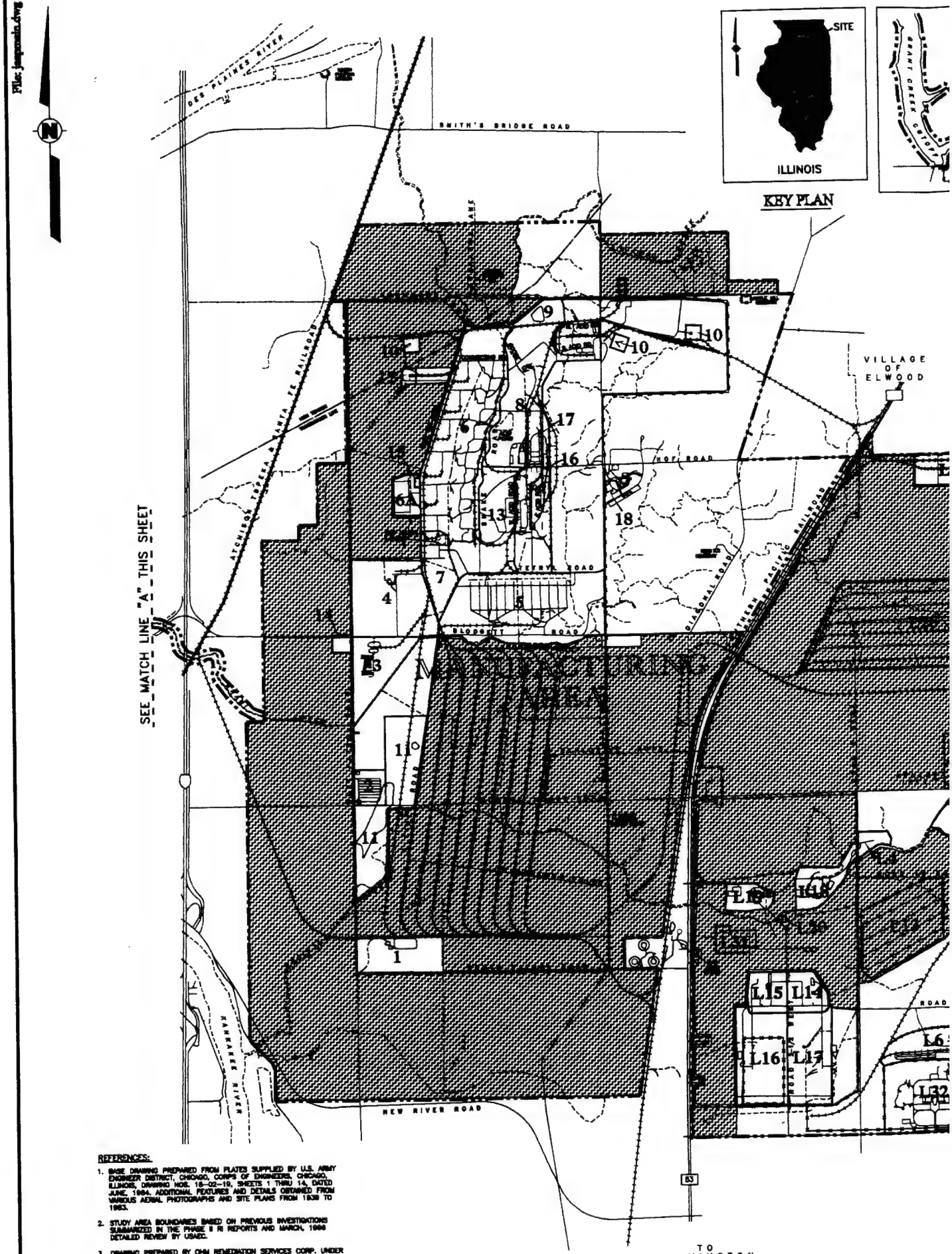


Figure 1-2
Land Use Plan

Joliet Army Ammunition Plant
Will County, Illinois

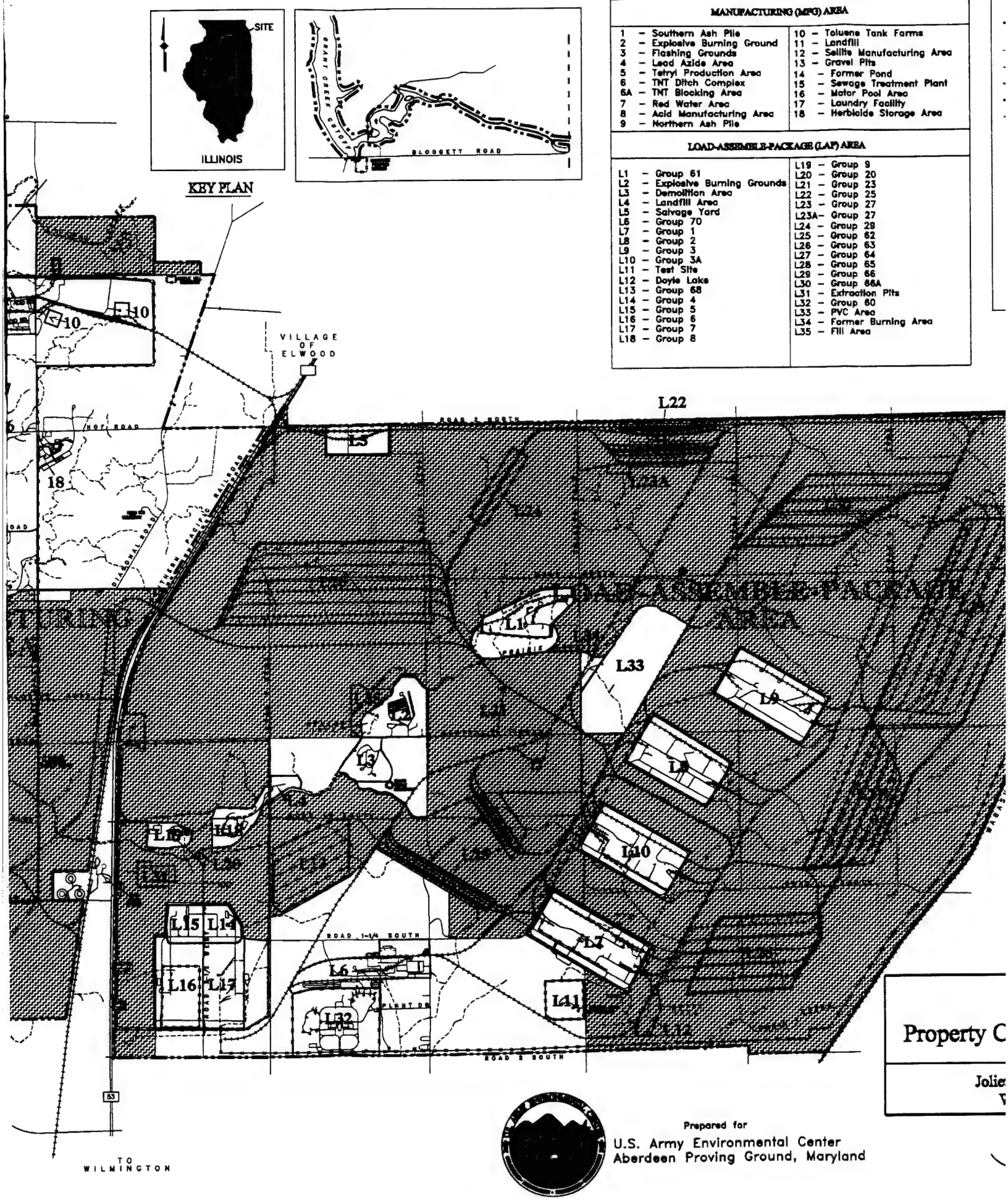
Prepared for
Environmental Center
Proving Ground, Maryland

PLEXUS scientific



REFERENCES:

1. BASE DRAWING PREPARED FROM PLATES SUPPLIED BY U.S. ARMY ENGINEER DISTRICT, CHICAGO, CORPS OF ENGINEERS, CHICAGO, ILLINOIS, DRAWING NOS. 16-02-19, SHEETS 1 THRU 14, DATED JUNE, 1994. ADDITIONAL FEATURES AND DETAILS OBTAINED FROM VARIOUS AERIAL PHOTOGRAPHS AND SITE PLANS FROM 1939 TO 1993.
2. STUDY AREA BOUNDARIES BASED ON PREVIOUS INVESTIGATIONS SUMMARIZED IN THE PHASE II RI REPORTS AND MARCH, 1996 DETAILED REVIEW BY USAEC.
3. DRAWING PREPARED BY OHM REMEDIATION SERVICES CORP. UNDER CONTRACT WITH USAEC. CONTACT USAEC PROJECT MANAGER FOR ADDITIONAL PRINTS OF THIS DRAWING.



STUDY AREA DESCRIPTION

MANUFACTURING (MFG) AREA

1 – Southern Ash Pile	10 – Toluene Tank Farms
2 – Explosive Burning Ground	11 – Landfill
3 – Flashing Grounds	12 – Sellite Manufacturing Area
4 – Lead Azide Area	13 – Gravel Pits
5 – Tetryl Production Area	14 – Former Pond
6 – TNT Ditch Complex	15 – Sewage Treatment Plant
6A – TNT Blocking Area	16 – Motor Pool Area
7 – Red Water Area	17 – Laundry Facility
8 – Acid Manufacturing Area	18 – Herbicide Storage Area
9 – Northern Ash Pile	

LOAD-ASSEMBLE-PACKAGE (LAP) AREA

L1 – Group 61	L19 – Group 9
L2 – Explosive Burning Grounds	L20 – Group 20
L3 – Demolition Area	L21 – Group 23
L4 – Landfill Area	L22 – Group 25
L5 – Salvage Yard	L23 – Group 27
L6 – Group 70	L23A – Group 27
L7 – Group 1	L24 – Group 29
L8 – Group 2	L25 – Group 62
L9 – Group 3	L26 – Group 63
L10 – Group 3A	L27 – Group 64
L11 – Test Site	L28 – Group 65
L12 – Doyle Lake	L29 – Group 66
L13 – Group 68	L30 – Group 66A
L14 – Group 4	L31 – Extraction Pits
L15 – Group 5	L32 – Group 60
L16 – Group 6	L33 – PVC Area
L17 – Group 7	L34 – Former Burning Area
L18 – Group 8	L35 – Fill Area

Property C

Jolie

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

STUDY AREA DESCRIPTION

MANUFACTURING (MFG) AREA

Southern Ash Pile	10 – Toluene Tank Farms
Explosive Burning Ground	11 – Landfill
Flashing Grounds	12 – Sellite Manufacturing Area
Lead Azide Area	13 – Gravel Pits
Tetryl Production Area	14 – Former Pond
TNT Ditch Complex	15 – Sewage Treatment Plant
TNT Blocking Area	16 – Motor Pool Area
Red Water Area	17 – Laundry Facility
Acid Manufacturing Area	18 – Herbicide Storage Area
Northern Ash Pile	

LOAD-ASSEMBLE-PACKAGE (LAP) AREA

Group 61	L19 – Group 9
Explosive Burning Grounds	L20 – Group 20
Demolition Area	L21 – Group 23
Landfill Area	L22 – Group 25
Salvage Yard	L23 – Group 27
Group 70	L23A– Group 27
Group 1	L24 – Group 29
Group 2	L25 – Group 62
Group 3	L26 – Group 63
Group 3A	L27 – Group 64
Test Site	L28 – Group 65
Doyle Lake	L29 – Group 66
Group 68	L30 – Group 66A
Group 4	L31 – Extraction Pits
Group 5	L32 – Group 60
Group 6	L33 – PVC Area
Group 7	L34 – Former Burning Area
Group 8	L35 – Fill Area

LEGEND

- JOLIET ARMY AMMUNITION PLANT BOUNDARY
- ROAD OR PARKING AREA
- SEASONAL ROAD OR TRAIL
- RAILROAD
- FENCE
- DRAINAGE FEATURE
- [1] MANUFACTURING AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- [L1] LOAD–ASSEMBLE–PACKAGE AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- [14] HISTORICAL STUDY AREA BOUNDARY AND IDENTIFICATION
- PROPERTY COVERED BY THIS REPORT

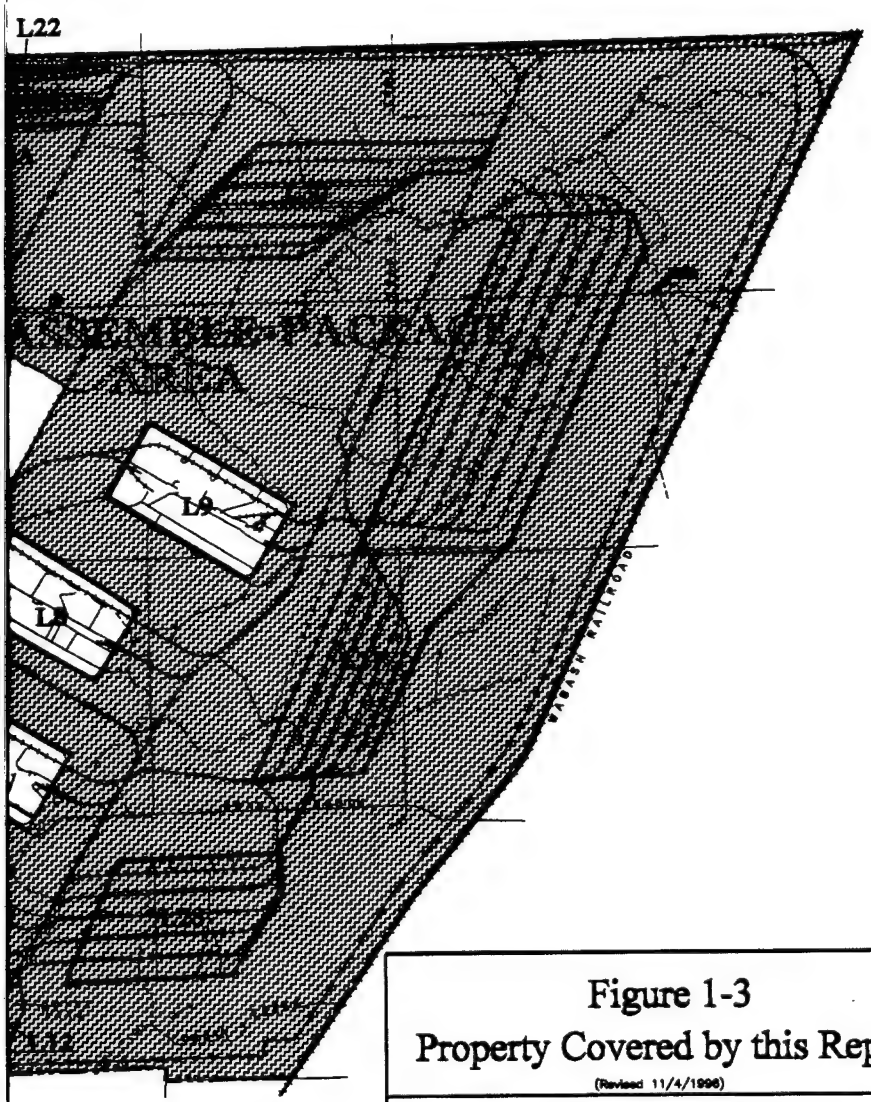


Figure 1-3
Property Covered by this Report

(Revised 11/4/1996)

Joliet Army Ammunition Plant
Will County, Illinois

Prepared for
Army Environmental Center
een Proving Ground, Maryland

PLEXUS scientific

2. SITE BACKGROUND

This section provides a description of the JOAAP including: location, property and operational history, physical environment, and biological and cultural resources. Issues pertaining to property transfer of specific parcels are addressed in subsequent sections.

2.1 Plant Location and Description

JOAAP is located in Will County, near Wilmington, Illinois. The facility is 17 miles south of Joliet, 22 miles northwest of Kankakee and 57 miles southwest of Chicago. Towns adjacent to JOAAP include Elwood, two miles to the north and Wilmington, eight miles to the south (ARMY01). The north boundary of the Manufacturing Area borders on the JATA (Joliet Army Training Area) and is within two miles of the Amoco Chemicals Superfund site (BICO01). An active Mobil Oil Refinery is located at the northwest corner of JOAAP. The Des Plains Conservation Area borders JOAAP on the west and south. Farming and grazing are conducted along other perimeter areas of JOAAP and a large portion of the facility consists of pasture and cropland with scattered woodlands (ARMY01). The topography is flat to gently rolling (ANLA01).

JOAAP is a government-owned contractor-operated (GOCO) military industrial installation which is currently maintained in a modified caretaker status. JOAAP is part of IOC, formerly the U.S. Army Armament, Munitions and Chemical Command (AMCCOM) (ANLA01, FIEL01). JOAAP no longer has a mobilization mission, and no maintenance is required except for those sites currently leased to Alliant Techsystems, Inc. (AEST01).

The plant has two distinct operational areas divided by State Route 53. The explosives manufacturing area (MFG area) is located west of Route 53 and encompasses approximately 14 square miles. The Load-Assemble-Pack area (LAP area) is located east

of Route 53 and comprises approximately 22 square miles. The MFG area produced trinitrotoluene (TNT), dinitrotoluene (DNT), trinitrophenylmethylnitramine (tetryl), lead azide, TNT demolition blocks, and explosive manufacturing process chemicals such as nitric and sulfuric acids, oleum, ammonium nitrate and sellite (sodium sulfite). The production facilities were clustered in the northern half of the MFG area and an explosive storage facility was located in the southern half. The LAP area contained facilities for the loading, assembling and packaging of high explosive artillery projectiles, aerial bombs and a variety of ammunition components. Approximately 1,500 buildings of either permanent or semi-permanent construction remain standing on JOAAP (ARMY01).

2.2 Facility History

The facility history is divided into several subsections. The operations history provides an overview of the activities at the plant and the subsections describe the manufacturing processes for many of the items produced. Information concerning expired leases is not complete. The regulatory history provides information concerning permits held and enforcement activities. General descriptions of previous environmental investigations are provided. Information relating to findings for specific areas are presented in Section 4 or the appendices.

2.2.1 Operational History

JOAAP was constructed in the early 1940's on land purchased by the U.S. Government for exclusive use by the U.S. Army as an arsenal and manufacturing facility. Prior to that time the entire area was used for agricultural purposes (ARMY01). The JOAAP mission was for production of munitions to support the U.S. in World War II. The JOAAP was constructed as two separate facilities. These facilities were separated by production mission and included the Kankakee Unit which manufactured explosives and the Elwood Unit which was an industrial munitions-loading plant (load, assemble and pack area). These two areas became known later as the MFG area and the LAP area, respectively.

Construction contracts for the Kankakee unit were signed on September 12, 1940, and those of the Elwood Unit on September 19, 1940. Production operations began in September 1941. By the end of World War II, JOAAP was the nation's largest ammunition manufacturer, producing more than 500,300 tons of explosive during the war (ANLA01). Peak employment reached 5,000 people at the Kankakee unit in 1942 and 14,000 at the Elwood unit in 1945 (ACOE06).

In August of 1945, both units were placed in standby status when ammunition production was halted. Standby activities consisted of maintaining the Kankakee and Elwood units for activation of production activities if needed. This included leasing areas (as discussed in Section 2.2.2), such as the sulfuric acid and ammonium nitrate plants (ANLA01). In 1946 the Kankakee and Elwood units were combined to form the Joliet Arsenal (ACOE01). The plant was reactivated for the Korean Conflict in 1952 and remained in operation until 1957 (AAMC02, ALSI01). In 1963, the facility was officially renamed the Joliet Army Ammunition Plant (ACOE01). On November 19, 1965, U.S. Rubber became responsible for the operation of the entire facility. The facility was reactivated for the Vietnam Conflict in 1966 and continued operation until 1976 when it was placed in an inactive status (AAMC02, ALSI01).

Subsequently, JOAAP was placed in a non-operating status in 1977 and was placed in Inactive-Modified Caretaker Status in 1993 (ACOE01). Alliant Techsystems, Inc., is currently the caretaker contractor. Alliant Techsystems, Inc. is producing, test firing and storing 25 and 30 millimeter (mm) cartridges and the AT-4 (anti-armor weapon, 84 mm, M136). In June 1989, a facilities contract was issued to Talley Defense Systems for utilization of Group 3 (AAMC03). Talley Defense Systems used the area for the manufacture of the 155 mm, M864 Base Burner Assembly until 1994 (AEST01, DOTA04).

The LAP area continued to conduct various munitions assembly activities for bombs, projectiles, fuses, and supplementary charges almost continuously from World War II

through 1975 (DAMO06). The LAP area contains load line groups capable of producing the standard 105 mm high explosive (HE) M1 Cartridge, the 8-inch Howitzer HE Projectile, 40 mm cartridges, M14 mines, bombs, and supplementary charges (ARMY01, AEST01). The MFG area contains ten of the twelve original World War II batch-type TNT lines, six newer "Continuous Flow" TNT lines, six of the twelve original tetryl lines (six have been demolished) and five DNT lines (AEST01).

During the last activation (1966-1976), the lead azide and TNT demolition block areas were declared excess and not used for production. They were subsequently demolished. Nitration of DNT also ceased during this time since it was more convenient to purchase it commercially in crude form and purify it at the plant (ARMY01).

In the early 1950s, the mission of JOAAP was expanded to include the loading of nonstandard research as development ammunition items, principally experimental bombs, which required considerable development of equipment and processing techniques. An experimental division conducted investigations in the fields of design and manufactured product testing, development of techniques for new and unusual items, and process development. From the mid-1950s through the early 1960s, JOAAP was authorized by the Ordnance Ammunition Command to operate a production development division to gather and initiate ideas applicable industry-wide and conduct development projects in the fields of design, techniques, and process development (HIST01).

Disposal operations were conducted at several locations throughout the facility. These included open combustion of explosive materials and demolition debris, incineration, landfilling and discharging of contaminated process waste water (DAMO04). Other significant activities conducted at JOAAP included: maintenance of ordnance and automotive vehicles; use of radioactive materials (depleted uranium, strontium from tracer compounds and ^{60}CO and ^{137}Cs used in instrumentation); use of biomedical materials; use of photochemical materials; pesticide application and storage; and the presence of transformers and other electrical equipment that may contain polychlorinated

biphenyls (PCBs) (ARMY01). Munitions filling, maintenance and disposal operations at JOAAP may also have resulted in surface discharge of explosive materials and production byproducts (DOAS06).

2.2.1.1 TNT Manufacturing Process

Twelve production lines were originally associated with TNT manufacturing at JOAAP. During full operations, ten lines were active, one was in active standby, and one was subjected to preventive maintenance. Primary components of each line included a Mono-, a Bi-, and a Tri-Nitration House, a Wash House and an Acid Fume Recovery House. One Packing House, administrative facilities and raw materials storage tanks were shared between two lines (JAAP09; ARMY01). The twelve TNT lines were served by six DNT lines (JAAP09).

Most TNT was manufactured using a batch-type operation which involved direct manual process control. Each batch converted 1600 pounds of toluene to 3360 pounds of purified product in a period of 40-45 minutes. Total TNT manufacturing capacity was close to 1700 tons per month when all lines were in operation (ARMY01). TNT lines 11 and 12 were demolished and replaced with six continuous TNT lines in 1974. The continuous TNT lines were only operated through a prove out period and were never used for active production (ARMY01, MEMO04).

In the batch production process, TNT was made by the successive chemical addition of three nitrite radicals to toluene using mixtures of nitric and sulfuric acids. The nitric acid acted as the nitrating agent and the sulfuric acid acted as a catalyst and dehydrant. Nitrating was done in three separate batch operations in three separate buildings. The first nitration was performed in the Mono-House with the addition of toluene to a mixture of weak nitric acid (60 percent) and waste acid from the Bi-House to produce mono-nitro-toluene ("mono-oil"). Mono-oil was transferred to the Bi-House and added to a mixture of weak nitric acid and waste acid from the Tri-House form DNT ("Bi-oil"). Bi-oil was

transferred to the Tri-House and added to a mixture of TNT, mixed acid (nitric and sulfuric), and oleum to produce TNT ("Tri-oil"). Tri-oil was transferred to a wash house where it was neutralized by the addition of water, soda ash, and purified by addition of sodium sulfite solution (selliting). The TNT slurry was transferred to a filter tank where it was washed and filtered on a screen leaving a layer of TNT crystals. Crystallized TNT was washed with water, melted, and dried. The TNT was solidified on a water-cooled flaker drum and the film was removed in the form of flakes by scraping with a beryllium knife. Flaked TNT was loaded into paper-lined cardboard boxes and sent, via conveyor, to the Nail House for sealing before shipment. Spent acid from the mono-nitrating step was sent to the acid recovery building along with acid fumes and vapors emitted during various stages of production. The recovery building separated nitric and sulfuric acids for concentration and reuse (AEHA09, TRWI01).

Process cooling waters used in each production step, and during acid recovery, were discharged into a trough system which flowed into the TNT Ditch Complex. Occasionally, large volumes of highly contaminated water were discharged when, due to operational problems, a batch was drowned (flooded with water) in the large drowning tanks located outside the nitrating houses. The frequency of these drowning procedures is not currently known. The drowned batch was discharged into the gutter system and subsequently to the TNT ditch. Water contaminated with nitrobodies, resulting from operation of a dust scrubber in the Wash House, was also discharged to the TNT ditch (AEHA09). Red water and wastewater from building washdowns, were collected in a sump, pumped to a settling tank and sent to the Red Water disposal Plant (TRWI01). The red water treatment plant is located south of the TNT manufacturing area (AEHA09). Sellite washwater, used to remove impurities from TNT, was concentrated by evaporation and the remaining thick liquor was incinerated (ARMY01) at the red water plant. The resulting ash was deposited into one of two ash disposal areas in the MFG area. In the evaporation process, condensate contaminated with nitrobodies was recovered and eventually discharged to the TNT ditch (AEHA09). Prior to installation of the incinerator

in 1966, all red water waste was discharged into open drainage ditches. This red water may have contained TNT, nitrobodies, sulfates and nitrates (AEHA09).

As of 1972, there was no treatment of waste water entering the TNT ditch until it reached Grant Creek where soda ash was added (AEHA09). Water samples were collected from TNT line 10 in 1972 with combined cooling water and scrubber water effluent from the Wash House. These samples contained TNT at levels averaging 36 mg/L (ARMY01).

2.2.1.2 DNT Production Process

In 1978, Joliet was the only Army Ammunition Plant with the capability to manufacture 2,4-DNT. As of 1978, the manufacturing capability had not been utilized for several years and the plant had been purchasing crude DNT from commercial sources and purifying it before use (ARMY01, TRWI01).

During the manufacturing of DNT, a fractional crystallization process was used for purification. Crude DNT was charged to a "sweat" pan and heated to 75°C. The temperature was then decreased in 5°C increments. When a temperature of 25°C was reached, most of the pure DNT was in crystal form and the liquid phase containing most of the impurities and was drained off to storage. Small amounts of impurities adhering to the crystals were removed by gradually increasing the temperature and draining the "sweat." When the freeze point reached 34°C sweating was discontinued and the charge was rapidly heated to 95°C with additional draining of impurities until tests indicated the freezing point of the remaining charge was above 63°C. Molten purified DNT was then transferred to a water cooled kettle where graining was induced by agitation as the charge cooled (ARMY01, TRWI01). DNT crystal powder was discharged to a hopper, screened and packaged in fiber drums for storage and shipment (ARMY01, HIST01).

DNT purification was essentially a pollution-free operation. Separated impurities (low-oil) were stored and re-used in manufacturing of TNT. Aqueous effluent from the

purification process was limited to the uncontaminated cooling water which was discharged to the TNT ditch (ARMY01, TRWI01).

2.2.1.3 Nitroxylene Production

Production of nitroxylene (NS) was started on December 10, 1943. Original instructions were to convert TNT lines 9 to 12 to NS production. However after conversion was started, it was determined that only Lines 9 and 10 should be converted (HIST39).

The alterations to the lines were not extensive. Production involved a single step nitration and the spent acid was not fortified for reuse. Three nitrators were used on each line, two tri-nitrators and the mono-nitrator. Xylene and mixed acid were supplied to each nitrator, and waste acid lines delivered the spent acid from the nitrators to the acid recovery building. Crude NS was pumped to a HCI holding tank and then to the wash house. The crude NS was then washed and neutralized with soda ash in the wash and slurry tanks at the wash house and dried with hot air in the TNT dryer. Purified NS was pumped from the wash house to the former oleum bulk storage tanks for storage prior to shipment by tank car (HIST39).

The spent acid was denitrified and the sulfuric acid was recovered in the acid recovery building. No attempt was made to recover the nitric acid as quantities were small. Neither the absorption nor the acid fume recovery systems were used (HIST39).

2.2.1.4 Tetryl Production

Tetryl was produced intermittently from the 1940s through July 1973 (ARMY01, DAMO04). JOAAP contained a total of twelve tetryl production lines with a total capacity of approximately 0.59 million kilograms per month. Six of these lines were razed in 1985 (ARMY01, BICO01). Each production line consisted of separate buildings for nitration, and refining. One drying building, one packing/shipping building, one

sulfating building, and one acid and fume recovery building served each group of six tetryl lines (ARMY01, TRWI01).

Tetryl was produced at JOAAP by a batch process. In the sulfating house, dimethylaniline was sulfated with 94 percent sulfuric acid to produce dimethylaniline sulfate (DMAS). DMAS was produced to aid in process control during nitration. The resulting dilute DMAS was transferred to the Nitration House and mixed with nitric and sulfuric acids under controlled conditions to produce a crude tetryl. Crude tetryl mix was cooled and transferred to a stainless neutch (a container with a filter) where the free acid was separated. Crude tetryl was neutralized, washed four times and transferred to the Refinery House. At the Refinery House, crude tetryl was washed and slurried through a tank, filtered and transferred to a dissolving tank where acetone dissolved the tetryl and washed it into a still charged with 45 percent acetone. The acetone was removed by evaporation and refined tetryl crystals were slurried, partially dried, screened to remove lumps and outsized particles, and transferred to the wet storage area (Lag House). Wet storage tetryl was transported by powder buggy to the Drying House, placed on screens and dried with hot air. The tetryl was transferred from the Dry House to the Pack House for packaging prior to shipment (AEHA09, ARMY01).

Spent acid and fumes from tetryl manufacture were treated in the Acid Recovery Building; dilute nitric and sulfuric acids were recovered to respective concentration facilities. Major sources of concentrated wastewater in the production of tetryl included: a continuous flow of cooling water from the Acid Recovery Building, the Nitrator, and Refinery Buildings; wash water contaminated with acid and nitrobodies; and cleaning of acid holding tanks in the Nitrator Building. Washwater from the Refinery Building and floor washwater from both the Nitrator and Refinery buildings were also significant wastewater discharges. Cleaning of drying screens with sellite in the Dry House and general floor washing of the Dry House and Pack House contributed smaller amounts of wastewater contaminated with tetryl particles (ARMY01, AEHA09). Catch boxes were provided in Nitration, Refining and Drying Houses to allow settling of large tetryl

particles which were sent for reprocessing. Wastewater generated in the production of tetryl was discharged into the Tetryl Ditch through Nitrating, Refining, and Dry House Ditches (ARMY01). The majority of wastewater in the Nitrating and Refining Ditches were cooling waters discharged from the Acid Recovery Houses and Nitrating and Refining Buildings. It was only during short periods at the end of the nitration and refining processes that concentrated process wastewaters were discharged to these ditches. The Acid Recovery Houses discharged bubble cap water, cooling water, and washwater and sellite solution used for cleaning operations. These wastewaters were discharged through three separate effluent lines. In the Dry Houses, wastewater containing tetryl particles was generated from sellite washing of drying screens (TRWI01). The Tetryl Ditch emptied into Grant Creek (ARMY01).

Wastewater was treated by settling in catch tanks. Occasionally sellite or soda ash was added to Ditch A to neutralize acid waste. Acid waste was generated from draining of waste acid storage tanks in the Nitrator Buildings and from acid wastewaters produced during crude tetryl washing (AEHA09).

A tetryl ditch neutralized with soda ash was sampled in 1972. The ditch was found to contain tetryl at an average concentration of over 400 mg/L prior to dilution with cooling water. The pH averaged 3.1 and sulfate was present at a concentration of 779 mg/L (ARMY01).

In 1957, a pilot refining unit was added to the continuous tetryl nitration unit. The equipment produced tetryl from dinitromethylanaline. The nitrification was conducted in dichloroethane with subsequent separation of the solvent and crystallization of the tetryl (HIST20).

2.2.1.5 Acid and Fume Recovery (AFR) Process

Every TNT line and each group of six tetryl lines employed an Acid Fume Recovery (AFR) House. The exhaust fumes from the three nitration Houses were cleaned in scrubbers and discharged to the atmosphere through stacks. Scrubbers were ring-packed towers which operated in series. Liquid wastes from the AFR operation included cooling water, water used for floor washing and spill cleanup (ARMY01). In the TNT area, these waste waters were discharged into the TNT Ditch which empties into Grant Creek. In the tetryl area, these wastewaters were discharged into Tetryl and Nitration Ditches which empty into Grant Creek (TRWI01).

2.2.1.6 Nitric Acid Concentration

Seventeen nitric acid concentrators were in operation at JOAAP (six in Acid Area 1, five in Acid Area 2, and six in Acid Area 3) with a total rated capacity of 22.8 million pounds per month as 100 percent nitric acid. These units produced concentrated nitric acid (98 percent nitric acid) from dilute acids produced in the ammonia oxidation plant (AOP) and AFR systems (ARMY01, TRWI01).

The nitric acid concentration process was a continuous process in which dilute acid from the AOP or AFR systems was distilled in the presence of sulfuric acid. The diluted sulfuric acid (75 percent) was removed and concentrated in the sulfuric acid concentration facilities (TRWI01).

Wastewaters in the nitric acid concentration process originated from occasional acid spills, floor washings and water used for cooling (ARMY01, TRWI01). The nitric acid concentration units in Acid Areas 1 and 2 discharged wastewaters through the Acid Ditch into the Tetryl Ditch which empties into Grant Creek. Wastewater from Acid Area 3 entered Goose Creek which empties into Jackson Creek (TRWI01).

2.2.1.7 Sulfuric Acid Concentration Process

Twenty sulfuric acid concentrators were operated at JOAAP (three in Acid Area 1, four in Acid Area 2, and thirteen in Acid Area 3) with a total rated production capacity of 103.8 million pounds per month as 100 percent sulfuric acid. Acid Area 4 was capable of producing strong (109 percent) sulfuric acid and oleum by the sulfuric acid regeneration (SAR) method (ARMY01, TRWI01).

The original sulfuric acid concentration operation was a continuous process in which dilute acid (68-75 percent) was concentrated to 93 percent in an evaporator drum where hot gases (650°C) from an oil fired furnace passed countercurrent over the acid (ARMY01, TRWI01).

Wastewater originated from occasional acid spills, floor washings, and water used for cooling. High acidity (low pH) and sulfate content were the major characteristics of these wastewaters (ARMY01, TRWI01). The sulfuric acid concentration units in Acid Areas 1 and 2 discharged wastewaters through the Acid Ditch into the Tetryl Ditch which empties into Grant Creek. Wastewater from Acid Area 3 entered Goose Creek which empties into Jackson Creek (TRWI01).

2.2.1.8 Nitric Acid Production

Both TNT and tetryl manufacturing consume nitric acid. The acid recovered in the AFR process was supplemented by addition of make-up acid from fourteen AOPs (four in Acid Area 1, four in Acid Area 2, and six in Acid Area 3) which produced weak (60 percent) nitric acid by the ammonia oxidation process. The production capacity was 37.4 million pounds of 100 percent nitric acid per month when all units were operating. Acid Area 4 had sufficient capacity to replace the AOP in the other acid areas. The new AOP and direct strong nitric acid plant added production capacities of 7.8 and 7.6 million kilograms of 100 percent nitric acid respectively per month (ARMY01, TRWI01).

In the ammonia oxidation process, a mixture of ammonia gas and air was combusted in the presence of a catalyst (90 percent platinum, five percent palladium, and five percent rhodium) to produce nitric oxide. The gas was cooled and excess air was added to convert the nitric oxide to nitrogen dioxide. Water formed in the ammonia oxidation step reacted with nitrogen dioxide producing nitric acid and nitric oxide. Dilute nitric acid (52 percent) was formed from cooling and condensing. The acid was then sent to and absorption column for concentration. Nitric oxide produced in the last reaction was oxidized by excess air to form nitrogen dioxide. The gases were then removed by aqueous scrubbing in countercurrent absorption towers. The acid produced in the towers contained 60 percent nitric acid which was concentrated to 98 percent in the nitric acid concentration units as needed (TRWI01).

Acid Area 4 produced both weak and strong acid in a single operational sequence. The system produced 98 percent nitric acid directly from ammonia oxidation and without the use of sulfuric acid. The nitric oxide from the combustion of ammonia was cooled, and compressed. The nitric oxide was then converted to nitrogen dioxide by oxidation with air followed by strong nitric acid. Oxidation with nitric acid produced weak nitric acid which was removed from the process. The gas phase containing nitrogen dioxide was cooled in a brine cooler and absorbed within concentrated nitric acid. The exit gases were scrubbed and vented. Nitrogen dioxide containing nitric acid was heated in a "bleaching" tower to distill the nitrogen dioxide which was cooled in a brine cooler. This cooling resulted in the formation of dinitrogen tetroxide which was distilled, liquefied, mixed with weak acid and reacted with pure oxygen to form strong nitric acid (TRWI01).

Wastewaters from Acid Area 1, 2, and 3 AOP facilities included cooling water, water used for cleanup of spills, and floor and equipment washing (ARMY01, TRWI01). Wastewaters in Acid Areas 1 and 2 were discharged through the Acid Ditch into the Tetryl Ditch which empties into Grant Creek. Wastewater from Acid Area 3 entered Goose Creek which empties into Jackson Creek. Acid spills and drips from Acid Area 4

were routed to a sump and pumped to the product acid line. Wastewater from Acid Area 4 was generated from cooling tower and boiler blowdowns, water used for clean up, and regenerant waste from water demineralization units. The regenerant and blowndown wastewaters were handled in the Acid Area 4 wastewater treatment facilities (TRWI01).

In 1955, several solvents were investigated as substitutes for the carbon tetrachloride used for cleaning AOP filters. Vythene, Penolene 643, Solvent M-6, and Dow Chlorethane were found to be suitable replacement solvents (HIST43).

2.2.1.9 Oleum and Sulfuric Acid Production

Oleum (a mixture of sulfuric acid, and sulfur trioxide) was manufactured in Acid Area 3 until January 1974 (ARMY01, TRWI01). Three oleum production units were operated by Wilson Chemical Company and supported TNT production lines (AEHA09, ARMY01).

Oleum was produced by melting sulfur, burning the sulfur to produce a sulfate gas and filtering the gas to remove dirt. The gas was cooled prior to entering absorption towers. Sulfuric acid towers dried exhaust gases, which were then heated and passed over a vanadium pentoxide catalyst for conversion of the sulfur dioxide to SO_3. Oleum (109 percent Sulfuric Acid) exiting the absorption towers was continuously mixed with anti-freeze (nitric acid) (AEHA09, TRWI01).

Wastewaters generated in this area were mostly cooling water and water from the scrubbers. Other discharges included acid spills, blowdown containing water softeners (including organophosphates), and acid tank car drainage and washout (AEHA09, TRWI01). When Acid Area 4 was operated, wastewater was sent to the Acid Area 4 wastewater treatment facility (TRWI01).

2.2.1.10 Sellite Production

Sellite is a solution of sodium sulfite that was used to remove impurities from TNT. The Sellite Production Area is located in the northwest section of the MFG area. Two sellite production units were operated at JOAAP (ARMY01, TRWI01).

Sellite was manufactured by burning sulfur to produce sulfite, which then passed into a spiral packed scrubber tower. Sulfite gas was cooled and countercurrent scrubbed to remove sulfur trioxide and other impurities. Cooled scrubbed gas passed into an absorption tower where the sulfite was absorbed by a solution of sodium carbonate (soda ash) in a countercurrent packed tower. The balance of the gas stream passed through a venturi, a cyclone separator, and then a stack to the atmosphere. Liquid discharged from the tower flowed into a batch tank and was recirculated until the desired strength (16 percent sodium bisulfate) was obtained. The finished product was then pumped into one of the four storage tanks at the plant. The soda ash solution used in the process was about 22 percent in strength and was prepared by dissolving commercial soda ash in water (ARMY01, AEHA09, TRWI01).

Wastewaters from gas scrubbing in the sellite area contained sulfur, ash, sulfate and impurities. Other wastes included spills of soda ash and sellite solutions, floor washing, and spill cleanups (ARMY01, AEHA09). Sellite effluent was characterized by a widely fluctuating pH, low dissolved oxygen and high concentrations of sulfite and sulfate (ARMY01, TRWI01). Sellite wastewater was treated by adjusting the pH with soda ash and oxygenation by mechanical surface aeration in a small flow through lagoon. This wastewater was then discharged to the Sellite Ditch which flows to Grant Creek (ARMY01, AEHA09, TRWI01).

2.2.1.11 Lead Azide Process

In preparation for lead azide production, sodium azide crystals and flaked lead acetate were dissolved in deionized water in separate tanks. In a third dissolving tank, deionized water, sodium carboxymethylcellulose, and a small amount (one percent) of sodium azide solution were mixed. Lead azide was precipitated by piping solutions from the three dissolving tanks to a precipitator containing a heel solution of deionized water, Empilon soap solution (ten percent) and sodium carboxymethylcellulose (HIST01). Precipitated lead azide was then purified by washing (ARMY01). Lead azide was placed into bags, tied with a batch tag, over-packed in plastic bags and packed in drums. The bags were surrounded with a sawdust and alcohol mixture (HIST01). In later years, lead azide was repacked into ceramic containers due to deterioration of the drums.

Process waste from lead azide production was neutralized in two steps; 1) waste was treated with sodium nitrite and nitric acid; and 2) this was then neutralized with sodium carbonate and sodium hydroxide. Subsequently, the material was routed to a holding pond north of the facility. The waste was neutralized prior to release into Grant Creek (ARMY01).

2.2.1.12 Asbestos Putty Production

Two types of asbestos putty, Red Asbestos Putty and Blue African Asbestos Putty, were manufactured for use as a sealant primarily in places such as recovery towers, packing glands, etc. (UCCI31). The putty was manufactured in Building 739-1 located north of the Box Factory (MEMO13). The Red Asbestos Putty was a mixture of 12.6 percent white lead with linseed oil, 3.4 percent red lead, 11 percent barium sulfate (barytes), 45 percent white asbestos fiber (36L grade), and 28 percent raw linseed oil. The Blue African Asbestos Putty consisted of 17.7 percent china clay, 35.4 percent white asbestos powder 25 PM, 29.2 raw linseed oil, and 17.7 percent blue African asbestos fiber (UCCI34, USOP23). The putty was sealed in pails immediately following the mixing.

Typical orders were 1,170 pounds of Red Asbestos Putty and 900 pounds of Blue African Asbestos Putty (USOP23).

2.2.1.13 LAP Area Production Processes

Past production processes in the LAP area included loading, assembly, and packing of 40 mm and 105 mm cartridges, 8-inch projectiles, cluster bomb units, fuses, supplementary charges and M14 mines. The melt-load operations were usually carried out in Groups 1, 2, 3, 3A, and 4. The basic process and procedures were the same for all high explosive cast ammunition items. For example, in Group 4 where the 40 mm high explosive cartridge (M406) was produced, Composition B (a mixture of TNT and RDX), was melted and loaded into projectiles. The loaded projectiles were cooled, transferred to an assembly building for installation of end items and inspection. Acceptable rounds were packed for shipment and storage (ARMY01). Groups 4, 5, 6, 7, 8, and 9 were involved in fuse, booster, primer, or detonator loading (SPED01). Support activities in the LAP area included maintenance shops, a laundry building, a test range and storage facilities (TRWI01).

Wastewaters from LAP area operations originated mainly from steam-out and wash-out of rejected bombs, and from washing of equipment, floors and the ventilation system. Wastewater accumulated in concrete sumps measuring approximately 20 feet long and eight feet deep. Sump wastewater was either trucked or pumped to a central sump/feed basin. The remaining sludge was shoveled out and transported to the Burning Grounds for disposal. Wastewater from this area was tinted pink due to the presence of nitrobodies and is referred to as "pink water". Pink water was treated in a two step process that included: 1) filtering in diatomaceous earth to remove gross and suspended solids (the filter required replacement on a weekly basis); and 2) treating water in activated carbon columns (1,000 pounds of carbon per column) to remove dissolved explosives (TNT and RDX). This water was then discharged into Prairie or Jordan Creek

(ARMY01, AEHA09). Wastewater from Group 4 was hauled by truck to the Group 3 holding tank for treatment (AEHA09, TRWI01).

Solid wastes generated in the LAP area included waste explosives, propellants, spent carbon, spent diatomaceous earth, sludge from pink water treatment systems and inert combustible wastes contaminated with explosives (ARMY01). Typically, one column of spent carbon was produced each month and disposed of at the LAP area Burning Ground (AEHA09). The spent diatomaceous earth was also burned at the Burning Grounds (TRWI01). Solid waste processing/disposal methods used at the LAP area included: 1) sale of excess wood as kindling, 2) sale of wire banding as metal scrap, and 3) open burning of explosives and explosive-contaminated wastes (ARMY01). There were three burning grounds in the LAP area, one for burning of explosives (L2), another for burning contaminated wastes (L3), and a third (L34) for burning of unknown types of materials (ARMY01, DAMO06).

Effluent from the wastewater treatment plant in the LAP area was sampled in 1972. The water contained TNT at a concentration of 3.7 mg/L and RDX at a concentration of 19.5 mg/L (ARMY01).

2.2.2 Occupancy and Lease History

The entire JOAAP facility originally encompassed approximately 36,000 acres. The LAP area comprised 14,820 acres and the MFG area comprised 21,272 acres (HIST01). Land area available for ordnance production activities was reduced over the years as various parcels were turned over to other entities or excessed. Portions of the entire facility have been used for "agricultural purposes" since 1942. Currently, certain land tracts are included in the Federal Government's public outlease program which permits farmers to lease unused land on selected military installations for agricultural activities. In 1978, there were over 80 agricultural leases associated with JOAAP (ARMY01, ANAL01). As of 1990, agricultural activities were permitted on approximately 60 percent of the entire

facility. Approximately 8,740 acres of land were leased for cropland and 5,477 acres leased for grazing. (ANLA01). In 1995, there were 103 agricultural tracts encompassing 17,006.5 acres (MEMO04). Other areas on JOAAP were managed as woodlands and vacant areas have been managed as wildlife habitat (JAAP09). Hunting is allowed on a restricted basis (DAMO05).

The Kankakee Ordnance Plant (MFG area) was operated by DuPont until April, 1944 at which time U.S. Rubber (later Uniroyal) became the operating contractor. The Elwood Ordnance Plant (LAP area) was operated by the Sanderson and Porter Company until November 30, 1945 (HIST01). The Government then assumed operating responsibility and operated the LAP area until 1965 when Uniroyal became the operating contractor (HIST01). A facilities contract was issued to Honeywell in June, 1981 for use of lines in Groups 4, 5, 6, 7, 8 and 9 (HIST36, AAMC01). Many buildings were reconstructed or rehabilitated to meet needs for production of 25 and 30 millimeter ammunition. Honeywell was also assigned storage in Groups 62, 64 and 68 for their use (AAMC01). As of 1984, Honeywell was using Group 4 for the production of the 25 mm Bushmaster, Group 5 for the production of 30 mm GAU-8, and Group 7 for the production of the 30 mm lightweight HEDP (HYWL04). In 1989, Honeywell began using Group 3A, Group 65, and Group 64 (partial) for the production of the AT4 (AAMC03). Honeywell Defense Systems was purchased by Alliant Techsystems, Inc. which is still present at JOAAP.

The following is a complete list of materials manufactured as complete units (either ammunition or weapon systems) by Alliant Techsystems/Honeywell Ammunition at JOAAP (MEMO20):

<u>25 mm Rounds</u>

M910-TPDS-T	PGU-38 HEI	PGU-23 TP
PGU-25 HE	PGU-32 HEI-T	M791 APDS-T
M792 HEI-T	M793 TP-T	MOD-210 HEI-T

30 mm Rounds
TP-PGU-15 HE-I-PGU-14 AP-I-PGU-13

LW30 mm Rounds
TP-M789 HEI-M788

AT4 Weapon
AP-T-M136

AT8 Weapon
HE - No known "M" number

SMAW - Cartridge
AP-T - No known "M" number

From May 1988 through 1990, A-Z Technology operated in Group 2 and buildings 66-45 and 66-47 (UCCI01, MEMO09). A-Z manufactured the Lightfoot rocket system which was designed for mine clearing. The system consisted of a rocket, 1,000 feet of detonating cord, and four blasting caps (MEMO09).

The sulfuric acid production facility was leased by Wilson Chemical Company from 1958 to 1974 (AMMC02). In 1959, Wabash Chemical Corporation leased the oleum facilities (HIST23). In October 1962, Wabash defaulted on the lease and ceased operating (HIST31). As of 1972, the oleum facility was operated by Central Chemical Division of Wilson Pharmaceutical and Chemical Corporation (AEHA09). From the early 1950's to 1958, Armour Company leased the ammonium nitrate facility (Group 61) on the LAP area for the production of fertilizer (ARMY01). In 1965, U. S. Rubber was given the responsibility for maintenance of the Elwood Unit (LAP area)(AMCI02).

In the 1950's, the Acid Areas were leased to E. I. DuPont de Nemours Company and were used to produce ammonium nitrate solution (ACOE06).

In the 1950's, the western portion of the MFG area was deeded to the State of Illinois for use as a wildlife refuge (ARMY01). This property extends west to the Des Plaines and

Kankakee Rivers. During the 1960's, a northern parcel of the MFG area was deeded to the Army as JATA (ARMY01). Between 1946 and 1965, a parcel of the facility on the eastern border was also excessed (BICO01). It was established that these areas were never used for manufacturing, nor were there any records of manufacturing activity within the property (ARMY01).

Talley Defense Systems was issued a facilities contract for Group 3 and buildings 64-3 through 64-8 for the manufacture of the 155 mm, M864 Base Burner Assembly in June 1989 (AAMC03, AEST01, DOTA04, UCCI01). Production was scheduled to start in 1991 (AAMC03). Operations of Talley ceased in November 1994 (DOTA04).

Various utility rights-of-way (e.g., a 765- kilovolt transmission line) have been granted within the JOAAP under long-term lease agreements. Other easements or permits include: 1) Tenneco Gasoline Transmission Co.; 2) Commonwealth Edison Public Service Co.; 3) The Alton Railroad Co.; 4) Atchison, Topeka & Santa Fe Railroad; and 5) The State of Illinois (JAAP09).

In 1964, the USDA held a permit to conduct crop rotation experiments on 140 acres at JOAAP (JAAP09).

In the first half of 1955, an existing building at the Kankakee Unit was reconverted for use by the Atomic Energy Commission. In addition to the re-conversion of the building, a guard headquarters was erected, and a security fence and appurtenance were installed to provide maximum protection. The entire job was handled as an emergency (HIST43, HIST49). Argonne National Laboratory leased two buildings: 713 in May 1959 and 25,000 square feet of 814 in November 1959. The buildings were used for equipment and machinery storage under permits issued to the Atomic Energy Commission (HIST23, HIST24, HIST25). Atomic bomb components were stored in these buildings. It is unclear if the building referred to in the 1955 annual histories is one of those identified as being used for storage in 1959 (FIEL01).

Records of existing outgrants are maintained by the USACOE. A listing of the existing non-agricultural outgrants was obtained from the Corps and is presented as Table 2-1.

2.2.3 Regulatory History

As an industrial facility, JOAAP has been subject to various regulations. Alliant Techsystems at JOAAP is currently operating under RCRA permit. The USEPA identification for this facility is IL7213820460 (JAAP16). The facility is identified in USEPA data bases by several identification numbers and names:

• Uniroyal Chem Co-Joliet Army Ammunition Plant	FINDS	IL0000222430
• US Army Joliet Army Ammunition Plant Uniroyal	RCRIS-LQG	IL7213820460
• (aka Joliet Army Ammo Plt MFG area)	RCRIS-TSD	
	RAATS	
• Joliet Army Ammunition Plant	FINDS	IL0000918243
• Joliet Army Ammunition Plant Honeywell Facility	ERNS	
• Talley Defense Systems JOAAP GP3	FINDS	ILD984774463
	RCRIS-LQG	
• Talley Defense Systems JOAAP GP64	RCRIS-SQG	ILD984775510
	RCRIS-TSD	
• Alliant Techsystems Inc	FINDS	0000090894
• Joliet Army Ammunition Plant LAP Area	CERCLIS (NPL)	IL0210090049
(aka. Alliant Techsystems Inc., Alliant Techsystems Inc. Joliet LAP area Facility)		

Within the RCRIS database, the types of wastes produced are identified. This information has been tabulated and is presented as Table 2-2.

Five NPDES permits have been issued to JOAAP. Notices of violations from the Army Compliance Tracking System are summarized in Table 2-3. The permits are as follows (ARMY01):

- IL0033031 LAP area STP
- IL0033049 Septic Tank
- IL0033057 MFG area STP
- IL0033065 Brown Circle STP
- IL0002666 Industrial Waste

CERCLA, as amended by the Superfund Amendments and Re-authorization Act (SARA), addresses the clean up of inactive hazardous waste sites. The on-going remediation efforts at JOAAP are guided by these acts and are part of the U.S. Army Installation Restoration Program (IRP). Remedial Investigations (RIs) have been completed and Feasibility Studies (FSs) associated with several of the former operation units are currently being conducted at JOAAP.

In October 1984, the MFG area was proposed for placement on the National Priority List (NPL) and designated as a Superfund site based on the Hazard Ranking System (HRS) score of 32.08. The MFG area was placed on the Final NPL in July 1987 (DAMO05, EPAV15). In April 1985, the LAP area was proposed to be placed on the NPL with a HRS score of 35.23. The LAP area was placed on the Final NPL in March 1989 (DAMO06, EPAV15).

USEPA, the State and the Army signed a Federal Facility Agreement (FFA) for cleanup activities at JOAAP in May 1989 (EPAV01).

JOAAP was subject to 52 industrial waste effluent violations during one three-month period in 1977. These violations included permit wastewater concentration exceedences for chemical oxygen demand, nitrates, nitrites, sulfates, iron, suspended solids and pH (ARMY01).

On January 6, 1995, the State of Illinois granted clean closure for three hazardous waste storage areas (bunkers 66-86, 66-87 and 66-88) (JAAP16). Alliant Techsystems has

obtained a RCRA permit to utilize seven igloos in Group 68 (L13) for hazardous waste storage (MEMO05, MEMO15).

The Citizens for a Better Environment initiated action before the Illinois Pollution Control Board against JOAAP in 1972 for water pollution (ARMY01). This was in response to high concentrations of mercury in water discharges (HIST09). The later discharges were observed on the land used by Uniroyal, Inc. (EPAV03). In 1973, the State of Illinois filed a complaint against JOAAP for violation of the 1970 Federal Clean Air Act. USEPA filed a claim in 1977 for a similar violation (ARMY01). The USEPA also filed notice of violation in 1977 for water pollution. These actions were settled and by 1978 there were no legal actions pending against JOAAP (ARMY01).

2.2.4 Previous Environmental Investigations

Past environmental studies conducted at JOAAP include Installation Restoration Surveys, Phase II contamination surveys, a surface water sampling investigation, historic aerial photographic interpretation, the Midwest Site Confirmatory Survey, soil sampling and baseline studies, an underground storage tank (UST) investigation, outfall monitoring and sampling of PCBs in soil (DAMO12). Summaries of the major investigations are presented below. The significant findings of the investigations are presented in Section 4 and Appendixes B, C, and D of the PAS.

INSTALLATION ASSESSMENT (ARMY01). The purpose of the 1978 Installation Assessment at JOAAP was to identify and assess past operations with the potential for hazardous material/waste production and contaminant migration. This investigation, performed by the U.S. Army, included a site reconnaissance, a records search, interviews with JOAAP personnel knowledgeable about the history and operations of the installation, and contact with various Federal Government agencies. No analytical samples were collected during this investigation.

Upon review and analysis of information collected, the Installation Assessment concluded that a number of previous manufacturing and disposal operations at JOAAP could have resulted in contamination and migration of contaminants. These operations included open combustion, incineration, burning, landfilling, discharge to streams, and spills of process chemicals. The main contaminants of potential concern were explosives, anions, metals, and PCB's. It was recommended that a survey be performed to determine if contamination was migrating beyond JOAAP boundaries.

INSTALLATION RESTORATION SURVEYS (DOAS01, DOAS03). As recommended by the Installation Assessment, the Installation Restoration Surveys were performed to determine if potentially hazardous materials had contaminated or could potentially contaminate the environment off-site through migration via surface or subsurface routes. These investigations delineated nine study areas in the MFG area based on the production, manufacturing, disposal, or storage operation that had been conducted in the area.

PHASE II TECHNICAL REPORTS (DOAS04, DOAS05, DOAS06). The Phase II Technical Reports investigation conducted by Donohue & Associates, Inc., included an environmental survey to determine if industrial chemicals, explosives, or other toxic/hazardous materials had migrated beyond the boundaries of JOAAP via surface or subsurface routes. The report also included an assessment of the potential for future migration. The investigation addressed areas targeted for further investigation during the Installation Restoration Surveys. These areas included the Explosive Burning Ground, the TNT Ditch Complex and the Red Water Area.

The Phase II investigation also addressed environmental conditions at six parcels of land located along the western and southern boundaries of the MFG area. The parcels were proposed for excess. Based upon the results of the Phase II investigation, it was concluded that contaminated soils present in the TNT Ditch Complex should be remediated and that surface water and groundwater should be monitored. It was

recommend that the contaminated liquid and sediment in the Red Water Lagoon and any contaminated soils beneath the lagoon be remediated. Erosion control measures were recommended for both the TNT Ditch Complex and Explosive Burning Ground to minimize contaminant migration.

Low concentrations of potentially TNT-related organic compounds were identified in some areas beyond the installation boundary. These results suggested that migration of contaminants was occurring or could occur. Based upon results of the investigation, three of the parcels were recommended for release. However, because of uncertain water quality, retention of the other three parcels was recommended until the source of surface water contamination could be identified and remediated. Additional groundwater sampling or geologic investigations were recommended to verify future groundwater quality in the vicinity of these parcels.

INVESTIGATION OF GROUNDWATER CONTAMINATION (DAMO01). Sixteen existing monitoring wells in the MFG area were sampled by the Army Environmental Hygiene Agency (AEHA now known as the U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM)) in 1983, 1984 and 1985. All previous groundwater monitoring included typical drinking water parameters (e.g., pH, specific conductivity, etc.). Explosives analyses were first performed in 1983, and were repeated in 1984 and 1985. Analyses for some anions and metals were also conducted on groundwater samples during these investigations.

RED WATER LAGOON SAMPLING AND ANALYSIS, REMEDIAL ACTION (DOAS07). The Phase II investigation found significant amounts of contaminants in the Red Water Lagoon and determined that the lagoon was impacting surrounding areas. It was recommended that the liquid and sludge contained in the lagoon be remediated. As part of the remedial action plan for the lagoon removal, pre- and post-remedial action sampling and analysis studies were performed by Donohue & Associates, Inc., in 1983 and 1985, respectively.

The pre-remedial action sampling and analysis program included collection and chemical analysis of 30 soil core samples, four groundwater samples from existing monitoring wells, 13 surface water samples, and 13 sediment samples. Samples were analyzed for explosives, anions, and metals. Post-remedial action sampling consisted of the collection and analysis of 21 soil core samples, five surface water samples, and five sediment samples. The post-remedial action samples were analyzed for the same parameters as the pre-remedial action samples. These investigations indicated the presence of contaminants in groundwater, surface water, sediment, and soil cores. No conclusions or recommendations were made in the report.

MIDWEST SITE CONFIRMATORY SURVEY (DAMO01). Although water quality data had been collected during previous investigations, the U.S. Army Toxic and Hazardous Material Agency (USATHAMA) now USAEC determined that the data base needed to be expanded. Therefore, two rounds of groundwater monitoring and surface water sampling were performed at the MFG area in 1985 and 1986. The new and existing data were reviewed to assess the impact of former production and disposal operations. The data were also used to define site conditions, identify potential sources of contamination and assess the potential for contaminant migration. This investigation also evaluated the completeness of existing data and information, and determined the feasibility/necessity of remediating the sites.

The Assessment Report identified various migration pathways present at JOAAP and potential receptors for any contaminated groundwater migrating from JOAAP. Contamination was detected in the soil, groundwater, surface water, and sediment, though conditions did not indicate the need for immediate removal/treatment. However, data gaps were identified and it was recommended that these gaps be filled to permit an accurate assessment of existing contaminant conditions and an evaluation of potential remedial alternatives.

PHASE 1 REMEDIAL INVESTIGATIONS (DAMO01, DAMO06). The RI sampling performed in 1988 for the MFG area and 1991 for the LAP area was conducted to fill the data gaps identified during previous investigations. A site reconnaissance, records search and review of the study areas was conducted in order to develop a technical approach for the RI sampling.

The field investigation included a geophysical survey, drilling of exploratory boreholes, installation of monitoring wells, collection of environmental samples and chemical analysis of the samples.

Environmental samples collected during the Phase 1 RI sampling programs were analyzed for explosives, anions, metals, volatile organic compounds, basic neutral acids, PCBs, pesticides and total petroleum hydrocarbons (TPHCs).

INVESTIGATION AND EVALUATION OF UNDERGROUND STORAGE TANKS (ACOE02). An investigation of USTs at JOAAP was performed by the U.S. Army Corps of Engineers. This study, conducted between July and September 1989, was performed according to Title 40, CFR, Part 280 regulations and involved an inventory of all USTs at both the MFG area and LAP areas of JOAAP. During this investigation, 70 USTs were identified, inventoried, and evaluated for potential leakage. Less than one-half of these tanks were located in the MFG area.

Based on the investigation, seven USTs were identified to have potential leakage, one of which was located in the MFG area. This tank was a 15,000 gallon tank (Tank 21) located in the Acid Manufacturing Area. The potentially leaking tanks in the LAP area were not detailed in this report.

PHASE 2 REMEDIAL INVESTIGATIONS (DAMO05, DAMO11). Based upon the results of Phase 1 RI it was determined that additional data was required for various sites. Detailed field studies, and sampling and analysis of soil, sediment, surface water and

groundwater were conducted. These reports include summaries of studies completed by other investigators.

BASELINE HUMAN HEALTH RISK ASSESSMENTS (DAMO23, DAMO26). The 1994 and 1995 risk assessments developed quantitative assessments of the potential risks to human health posed by chemical contamination at each of the IRP sites. Current and likely future exposure scenarios were evaluated to determine if the sites could pose a potential threat to human health.

ECOLOGICAL RISK ASSESSMENT (AEHA10). The 1994 ecological risk assessment was conducted to determine if deleterious effects resulting from chemical contamination were present in flora and fauna at JOAAP. This was accomplished through the examination of existing environmental data, collection of additional samples where necessary, literature review, toxicity testing, and field surveys. Three study areas on the MFG area (M2, M4, M6) and three on the LAP area (L1, L2, L7) were selected for field investigation. Study areas were selected based upon presence of contaminants, and habitat viability (industrial areas were not evaluated). In addition, an ecological risk evaluation was performed for each of the creeks at JOAAP.

Several additional ecological evaluations have been performed at JOAAP. These include a Phase II aquatic study (CHPP01), deer tissue collection and analysis (AEHA11), and determinations of risk to the Upland Sandpiper.

REMEDIATION SITE RELEASE AND SURVEY PLAN BY ALLIANT TECHSYSTEMS AT JOAAP (SEGI01). Cleanup of depleted uranium (DU) contamination is currently being conducted by Alliant Techsystems, Inc. in IRP Study Area L18 (Group 8). Sand removed from this area, now stockpiled outside the ranges and overlooked during the decommissioning activities, was contaminated by DU projectiles. The cleanup plan includes actions necessary to survey and remediate all affected facility structures and the environs associated with the spread of DU (U-238).

The cleanup will excavate and remove contamination to an average activity of 15 pCi/g in accordance with Nuclear Regulatory Commission clean up levels. The DU clean-up will be concluded in the summer of 1996.

FIELD SCREENING ACTIVITIES. Dames & Moore conducted field screening activities in 1995 to better characterize sites at JOAAP. Samples were collected in L1, L2, L7, L8, L9, L10, M2, M3, and M7. Test pits were dug at M11 and the north gravel pit at M13 to characterize the wastes at these landfills. At M4, the Lead Azide Area, field screening for lead was conducted. In addition, at many of the sites samples were collected in order to determine if the materials would be considered RCRA hazardous wastes.

2.3 Utilities

The following sections present information on the utilities (water, electricity, sewers, and gas) at JOAAP. Most of the utilities at JOAAP date from the time the facility was constructed and are generally in poor condition.

2.3.1 Water Systems

The MFG area and the LAP area have separate water systems. The MFG area utilized river water and deep wells while the LAP area used only deep wells. Doyle and Kemery Lakes provide flood control for the LAP area (DOAS03). Kemery Lake was also constructed to hold fire protection water (BICO01).

Six non-functional water systems are located in the MFG area. The pump motors have been removed and placed in storage pending further disposition. The distribution piping for the systems is over 50 years old, 101.5 miles in length and ranges in size from 4 to 42 inches in diameter. The six water systems (river, well, filtered, mixed, potable and fire

water) were identified as having no value for future non-military use at the site (AEST01).

The river water system begins at two locations: one at the Des Plaines River and the other at the Kankakee. Raw water from these sources was used as cooling water for various manufacturing processes and as a supply for the treatment plants. River water was also one of the supply sources for the mixed water system (AEST01).

The well water system begins at 12 deep wells located in the MFG area. Pumps were used to draw water into two 300,000 gallon elevated tanks and two 500,000 gallon reservoirs. This water was used to supply the potable water system and was a back-up for filter and mixed water systems (AEST01).

The potable water system is an extension of the well water system where water was chlorinated, pumped to a booster pump, and then sent to two adjacent elevated tanks with capacities of 50,000 gallons and 100,000 gallons. The system supplied potable water to the entire MFG area and was a back-up for the fire water system (AEST01).

The filtered water system begins at the water treatment plant where river water was filtered and treated, then circulated by booster pumps. This water was used as boiler feed water at the two power plants, TNT wash water and make-up water for the cooling towers in the TNT lines and the acid plant (AEST01).

The mixed water system consisted of a combination of raw river water and well water mixed at a ratio to maintain required cooling water temperatures. No pumps were used in this system (AEST01).

In addition, there were seven wells drilled to supply water to individual farm houses occupied by plant personnel on the MFG area. Two temporary water supply wells (363 and 500 feet in depth) were installed on the MFG area during construction (ACOE06).

Within the LAP area, the water treatment, storage and distribution system is operational but is in a marginal state of repair with excessive leakage. Maintaining water quality poses significant problems. Future use of the water distribution system in the area will require an engineering study to determine if the existing system can be used (AEST01).

Naturally occurring levels of radium above USEPA Drinking Water Standards are present in groundwater at JOAAP (AEHA05). Elevated gross-alpha and Radon-226 levels were noted in northeastern Illinois (ARMY01). Further details are provided in section 4.1.20.

Industrial and domestic water demands of the LAP area are served primarily by one potable water system which includes fire protection water. Water is obtained from two deep wells, treated, and stored in a 1.2 million gallon above ground covered reservoir, then pumped to four elevated storage tanks of 150,000 gallons each. The system is operational and in use by the LAP area contractor, Alliant Techsystems, Inc. (AEST01).

Two additional shallow wells located in the LAP area, G26 and G65, serviced the north railroad classification yard and the southeast magazine storage area. They are not connected to the distribution system and were available for summer month operations (AEST01).

Each of the explosive loading lines, Groups 1, 2, 3, and 3A is equipped with a low capacity well (ranging from 135 to 834 feet in depth), which in an emergency, can be connected to the general distribution system. The combined pumping capacity of these four wells is 350 gallons per minute (AEST01, ACOE06).

The main sources of water for distribution in the LAP area are two deep wells about 2,350 feet apart. Each well has a 1,025 gpm line shaft pump driven by an electric motor. For standby purposes, there is one 1,000 gpm gasoline-engine-powered auxiliary pump (AEST01).

Water treatment and distribution piping require major upgrading; filter equipment was removed from service. Although the treated water was rated potable while the plant was active, it was not consumed. Bottled water was provided for drinking. Five hundred gpm and 1,000 gpm pumps were installed to pump water from the 1.2 million gallon covered reservoir to four elevated storage tanks. Due to the poor condition of the water distribution system, only the 500 gpm pump could be used and leaks within the water distribution lines required constant repair (AEST01).

2.3.2 Sanitary Sewer

All major areas of JOAAP were served by the sanitary sewer system which consists of vitreous clay tile with hand caulked joints (ARMY01). The MFG area is served by a sewage treatment plant on the west side of the MFG area and the LAP area is served by a sewage treatment plant on the west side of the LAP area. One additional sewage treatment plant is located on the north end of the MFG area and serves the Brown Circle residential area (HIST18). The LAP area plant still services the area operated by Alliant Techsystems Inc. (FIEL01). There were a total of 574,292 linear feet of sanitary and industrial waste lines at JOAAP (HIST18). In 1979, there were 39,000 linear feet of sanitary waste lines (HIST35, PESI01, PESI02). In many cases, isolated buildings were not connected to the sanitary sewage system and instead used septic tanks and drain tile fields for sewage disposal (JAAP08). Septic tanks were located in both the LAP area and MFG areas (AEHA09). A plant master plan indicates that 55 septic tanks served isolated buildings on the MFG area (ACOE06). The MFG area septic tanks in residential areas were replaced by a central sewage system in 1959 (JAAP08).

Cooling water drains constructed of concrete and vitrified clay pipes served the tetryl and acid areas. All pipe 24-inches and larger was encased in concrete. Wastewater sewers served the TNT and tetryl areas for disposal waste cooling water and wastewater from manufacturing processes. Hand caulked vitrified clay pipe was used throughout the

system. Prior to construction of the Red Water Plant, the wastewaters sewers emptied into an open flume (wooden box flume 3 by 4 by 3000 feet) constructed as a contour ditch on the west side of the ridge wher the plants are located. The flume discharged into Grant Creek west of the 811 magazine area (ACOE06).

Detailed descriptions of all the treatment plants and the areas from which they received waste has been documented by the Army (AEHA09). The MFG area sewage treatment plant lies on a five acre tract immediately west of the TNT Ditch and is not currently active. The plant was designed as a primary treatment plant in the 1940s and was converted to secondary treatment (modified activated sludge) in 1967. This plant includes two grit collectors and an aeration structure. The treated sludge was sent to drying beds. The condition of the sewer lines, which are over 50 years old, is unknown. The eastern leg of the sewer line terminates at the Administration Area, 1.3 miles east of the treatment plant (AEST01, TRWI01).

The former Sewage Treatment Plant (STP) for the MFG area was shut down in 1982 when a new treatment plant was constructed approximately 50 yards to the north. The former STP was removed from operation because it could no longer meet the National Pollution Discharge Elimination System (NPDES) requirements (AEST01). JOAAP personnel determined that it was more economical to build a new system than to refurbish the old one (TRWI01, AEST01). The former plant received waste from the operational areas within the MFG area and from the Administration Area. A television inspection of the sewer system was conducted in 1967 and revealed extensive groundwater infiltration in certain sections of the sanitary sewer lines throughout the installation (AEHA09).

The LAP area treatment plant was built in the 1940s and utilized Imhoff tanks and a trickling filter to provide treatment. The design capacity was initially 0.65 millions gallons per day. The plant received waste from several of the LAP area Groups, from the Group 60 administration area and from the White Circle Housing area in Group 60 (AEHA09). The sewer system consisted of 18 miles of sewer lines in 1959 (ACOE06).

A television inspection of this sewer system was conducted in 1967 and revealed groundwater infiltration in portions due to broken and leaking pipes, especially along the line from Groups 2 and 3. A treatment plant to serve Groups 2 and 3 was scheduled for completion in 1973 and was to remove from service much of the damaged line. Flow in excess of the design capacity bypassed the treatment plant and was discharged directly to Prairie Creek (AEHA09).

A new LAP area STP plant was built in 1984 with a design capacity of 1.2 millions gallons per day. The new STP used the Imhoff tank process, which includes a trickling filter, secondary settling, chlorine contact and effluent pumping to adjacent Prairie Creek. (ACOE03).

The Brown Circle STP, a package sewage treatment plant, received waste solely from the Brown Circle Housing Area. The plant was built in the early 1950's and utilized the activated sludge process for treatment. Design flow was reportedly 7500 gallons per day. The sanitary sewer lines serving the Brown Circle Plant were also television inspected in 1967. The inspection substantiated infiltration into the system (AEHA09). After 1984, effluent was pumped to the new MFG area STP. Effluent from this plant was discharged into Jackson Creek until 1986 (ACOE01).

2.3.3 Storm System

The storm drainage system at JOAAP consists of natural drainage features with storm sewers and ditches used to increase the runoff rates in areas where the rapid removal of storm water was considered essential, or in areas where the natural runoff is exceptionally slow. Sewers and ditches extend only as far as necessary to connect with adequate natural drainage features. The storm sewer systems were abandoned with the termination of explosive production (AEST01, JAAP08, ACOE06). There are approximately 16.5 miles of clay tile sewer pipe ranging from 8 to 24-inches and about 29 miles of ditches (ACOE06).

Surface drainage at the MFG area runs generally from the east to the west and southwest. Runoff is discharged by Jackson and Grant Creeks into the Des Plaines River and by Prairie Creek into the Kankakee River. Drainage conditions are generally good except in the Acid Areas and the lowland immediately west of the TNT area. Ditches and drains conduct surface water from the Acid Areas to Jackson and Grant Creeks and from the western portion of the TNT Area to a point outside the MFG area (JAAP08). An underground drain consisting of approximately 2,180 feet of 36-inch corrugated metal pipe runs along the east side of the MFG area to carry water draining from the high ground to the east along the Acid and Power areas to Grant Creek (ACOE06).

The LAP area uses sewer pipe and drainage ditches to accelerate natural runoff. Ditches conduct water to Prairie and Jordan Creeks. In 1989, JOAAP had eight NPDES permitted stormwater outfalls (AEHA06). Vitrified clay pipe was used in all of the manufacturing groups to collect storm water and discharge it to the nearby drainage ditches (ACOE06).

2.3.4 Electrical System

JOAAP receives electrical power from the Commonwealth Edison Power generating grid system. This power is produced by Dresden Station 12; Joliet Stations 9 and 29; and Will County Station 22, Romeoville. The electrical distribution system at JOAAP is in good operating condition, however, the distribution system in the MFG area has been shut down for several years. The main primary supply line to the site enters at the north western boundary of the property on the MFG area side, crosses JOAAP through the north west quarter of the Wilmington quadrangle, passes over the Mobil Oil transmission pipeline in a northeasterly direction, and crosses the Atchison, Topeka and Santa Fe Railway to the northwest boundary of the MFG area of JOAAP. It then passes across Jackson Creek and onto Joliet and Romeoville. The main supply line is divided and distributed to two substations: the new Acid Area substation and the north power

substation. Power is transformed from 34.5 KV to 6.9 KV at a South Power substation for South and North Powerhouse Station Bus Tie Lines. The Tie Breaker Interconnects are located at the high tension transmission line of Commonwealth Edison. The primary line segment numbers from the transmission line are 0903, and 1210. Line 1210 also distributes power to the Mobil Oil Refinery located northwest of the JOAAP and is triangularly bounded by Interstate 55, the Atchison, Topeka and Santa Fe Railway and the Des Plaines River to the north (AEST01).

The main transformer bank (two 10,000 KVA transformers) in the south MFG substation was owned by the Public Service Company of Northern Illinois. The transformer banks were oil-insulated and self cooled. There were two incoming line oil circuit breakers (132 KVA/600 amps) and 13 feeder oil circuit breakers. The north MFG substation is of similar design. There were 554 distribution transformers on the system (ACOE06).

Two electrical substations are located on the LAP area. One serving the north area and one serving the south. The north substation is no longer in service while the south substation serves the needs of Alliant Techsystems (AEST01, MCHL01). The LAP substation consisted of 1-5,000 KVA transformer and necessary switch gear (ACOE06). The LAP area south substation is currently operated by Alliant which also operated the MFG area north substation until early 1995 when it was taken out of service following an electrical fire (MCHL01). Information on PCBs and PCB containing equipment at JOAAP is presented in Section 4.1.8.

2.3.5 Natural Gas System

The natural gas pipeline remains buried in place but is terminated and stubbed by Northern Illinois Gas in the Arsenal Gate 10 area. The exact size of the gas distribution pipeline is not known. Natural gas may have been used at the site for power generation, steam for manufacturing or other uses. One use for natural gas in the explosive and fertilizer industries is the conversion of natural gas into ammonia (AEST01). Due to the

age of this system and since it has been unused for some time, its integrity is questionable.

2.4 Demography and Land Use

As discussed in Section 2.1 of this report, JOAAP is divided into two major functional areas, the MFG area to the west and the LAP area to the east. The two areas are divided by Route 53 (ACOE01). A small portion of the LAP area is currently operated by Alliant Techsystems but the facility is otherwise inactive.

Portions of the plant have been used for agriculture since 1942. Major crops include soybeans and corn. Areas with erodible soils are placed either in hay production or used for primarily for cattle grazing and some limited use for horses. Brush control is accomplished by cutting and piling. Hunting of game species is permitted on a restricted basis (ACOE01). Fishing is not permitted on-site but is permitted off-site in the three creeks and the Kankakee and Des Plaines Rivers. Groundwater is not used for irrigation (DAMO26) but is used for livestock.

Property to the north of the MFG area is currently known as the JATA which is used for Army Reserve training (ACOE01). Approximately 1,000 acres in the northeast portion of the MFG area is currently being transferred to the Veterans Administration for development of a cemetery (PSCO01). Various right-of-ways and easements have been granted within JOAAP and are discussed in Section 2.2.2.

The area surrounding JOAAP is rural farm land with scattered residences. Property west and south of the MFG area (Des Plaines Conservation Area) was deeded by the U.S. Government to the state of Illinois and has been used as a wildlife refuge since the 1950s. A Mobile Oil refinery lies northwest of the MFG area (ACOE01). The facility is located about 17 miles south of Joliet, two miles south of Elwood, and eight miles north of Wilmington (ACOE01, MAPS08).

Excess parcels at JOAAP are directed by the Illinois Land Conservation Act of 1995 for the following use: 1) a veterans cemetery; 2) the Midewin National Tallgrass Prairie; 3) two industrial parks; and 4) a county landfill. The Midewin Tallgrass Prairie will be a national preserve with outdoor recreation areas.

2.5 Physical Environment

This section discusses the physical environment (climate, topography, geology, soils, groundwater, and surface water) of the JOAAP area as background for evaluating potential migration pathways for contaminants. Additional details or local variations, where relevant, are provided in the individual site discussions.

2.5.1 Meteorology

The area around JOAAP has a predominantly continental climate characterized by relatively warm summers and cold winters. The climate is somewhat modified by Lake Michigan, which is located approximately 40 miles northeast of the installation. The mean annual temperature reported at the Joliet Weather Station, located 13 miles northwest of JOAAP, is about 50 degrees Fahrenheit (°F): the mean maximum is about 61°F and the mean minimum temperature is about 40°F. The highest recorded temperature was 109°F in July 1936 and the lowest was -25°F in December, 1872. The prevailing wind is from the southwest, with an average speed of 10.2 miles per hour (DAMO04, DAMO05). Windstorms have intermittently damaged buildings and interfered with operations at JOAAP (HIST40, HIST31, HIST07).

Average annual precipitation in the vicinity of JOAAP is 33.4 inches. Between 1959 and 1988, the highest recorded monthly precipitation was 17.10 inches in August 1987 and the lowest was 0.02 inch in September 1979 (ACOE01). Seasonal floods occur in the

spring during periods of heavy rainfall and have periodically caused extensive damage to fences, railroads and buildings at JOAAP (ACOE01, HIST08, HIST09). In 1957, Prairie Creek overflowed and caused flood damage to buildings in Group 9 (ACOE01). In June 1978, flood waters entered magazines in groups 63 and 65 (HIST34). Tornadoes are also prevalent in the installation area (ARMY01).

2.5.2 Topography

JOAAP is located within the northern part of the Central Lowlands physiographic province. Elevations vary from about 520 to 650 feet above mean sea level (msl). The present topography in this area is largely the result of relatively recent glaciations and is characterized by relatively flat topography and low relief. The principal topographic subdivisions within the installation are shown in Figure 2-1, which also shows the geological units present at the surface (DAMO04, DAMO05).

The most prominent topographic feature at JOAAP is an escarpment, approximately 50 feet high, that trends generally north-south through the installation (Figure 2-1). The escarpment extends from north of the TNT lines in the MFG area to the south-central boundary of the LAP area. The surface elevation of the land east of the escarpment is higher than that to the west (DAMO04, DAMO05).

The land to the east of the escarpment, including part of the MFG area and most of the LAP area, is a till upland. This till upland is underlain by glacial till, a heterogeneous mixture of clay, silt, and coarser particles deposited directly from glacial ice. The elevation of this surface feature is generally 610 to 650 feet above msl. Local relief in the upland till area consists of rolling hills and small stream valleys (DAMO04, DAMO05).

An outwash plain occurs immediately west of the escarpment throughout most of the MFG area. This plain is underlain by glacial outwash composed of relatively clean sands and gravel deposited by streams near the edge of a melting glacier. The outwash plain is

relatively level, with elevations generally between 540 and 560 feet above msl (DAMO04, DAMO05).

A low level plain occurs west of the outwash plain beyond the MFG area. This is underlain by Silurian dolomite bedrock, with a cover of 5 to 10 feet of alluvial or residual soil. This plain is relatively level, with elevations of 520 to 540 feet above msl. The LAP area lands are dissected and drained by four westward flowing streams (DAMO04, DAMO05).

2.5.3 Surface Water Hydrology

JOAAP lies within the Illinois River and Mississippi River drainage basins and is located near the confluence of the Des Plaines (west of JOAAP) and Kankakee Rivers (southwest of JOAAP) (DAMO04). The Grant Creek basin drains approximately 14.6 square miles, and the Prairie Creek basin drains approximately 19.3 square miles. Together these two basins cover approximately 70 percent of the JOAAP installation (DAMO11). Studies of historical floods in the area by the U.S. Geological Survey (USGS) and 100-year flood maps indicate that portions of the LAP area are subject to flooding. The streams at JOAAP, at least under low flow conditions, apparently act as sources of recharge to groundwater (i.e. losing streams). Locally however, they may be gaining streams (DAMO22).

Surface drainage at JOAAP is primarily controlled by means of open ditches flowing into creeks, and streams draining the facility (Figure 2-2). There are four major drainage basins (Grant Creek, Jackson Creek, Prairie Creek, and Jordan Creek) at JOAAP all of which flow from east to west into the Kankakee and Des Plaines River (Figure 2-3). Discharges from the plant are monitored under a 1993 NPDES permit (DOTA04).

Grant Creek flows through the central section of the JOAAP and drains most of the MFG area and a small portion of the LAP area side of the plant (DAMO04). This creek

received industrial waste material from Acid Areas 1 and 2, the Tetryl Area, the TNT Area, the Sellite Plant, boiler blowdown from the power plant, and the backwash and effluent from the sewage treatment plant in the MFG area (AEHA09). After leaving JOAAP, Grant Creek discharges into the Grant Creek cutoff, which flows into the Des Plaines River (DAMO04).

Jackson Creek flows through the northern section of the installation to the Des Plaines River (DAMO04). This creek received waste from the Brown Circle sewage treatment plant, the Oleum Plant, which includes acid tank car washout and ash pile runoff, and the Acid Area 3 (via Goose Creek) (ARMY01, AEHA09).

Prairie Creek and an unnamed creek, both tributaries to the Kankakee River, drain the remainder of the MFG area and most of the LAP area (DAMO04, DAMO22). Prairie Creek received wastes from the LAP area sewage treatment plant and from some operations in the LAP area. Jordan Creek received minor discharges of waste water from operations in the LAP area Unit (AHEA09).

Nine areas throughout the installation have been used as holding or settling ponds. The MFG area had two acid holding ponds, a sellite pond, a gravel pond, and a red water pond which was removed and covered with clay. The north acid holding pond was constructed in the late 1960s. It had a bentonite bottom and concrete sides with a 160 mil vulcanized rubber cover on side walls only (ARMY01, ACOE01). The south acid pond was constructed with a 20 mil PVC liner (ARMY01). The gravel pit (IRP Site 13) received filter water from the water treatment plant, boiler blowdown waste, and laundry waste (ARMY01). The red water pond, constructed in 1969, was lined. Lead azide was stored in a brick lined settling pond north west of the lead azide facility (used during three periods 1941-1945, 1955-1957, and 1968-1970). The LAP area contains a holding pond (constructed in the late 1960s with a bentonite bottom), a demilitarization settling pond, and Doyle Lake. A holding pond, located northeast of Group 23 burning ground, was used until 1961 to dispose of solvents, acids and oils (ACOE01).

The MFG area power plants and treatment plant discharges flowed into Grant Creek. Discharges from the two steam operating power plants on the MFG area contained fly ash, boiler blowdown, and waste regenerated from ion exchange treatment. Filter back wash water and lime sludge was discharged from a water treatment plant into the Acid and Tetryl Ditches which flow into Grant Creek. Effluent from the STP flowed directly into Grant Creek (ARMY01).

Other miscellaneous discharges in the LAP area included a laundry building which used a holding basin discharging into Forked Creek and eventually the Kankakee River. Nine oil-fired power plants discharged blowdown high in phosphates and dissolved solids into the sewer. A motor pool discharged oily waste water into a storm sewer emptying into the Kankakee River through Forked Creek (ARMY01). The motor pool is no longer in service.

Major sources of aqueous wastes from production operations at JOAAP were cooling water, process waste water, chemical spills and wash water from equipment and plant cleanup. Major aqueous waste contributors were the 12 batch TNT lines, 12 batch tetryl lines, AFR systems, 14 AOPs, 17 nitric acid concentrators (NAC), three oleum plants, 20 sulfuric acid concentrators, two sellite plants and 12 red water incinerators (ACOE01).

USGS studies of historical floods in the area and 100-year flood maps produced by the Federal Emergency Management Agency (FEMA) indicate that portions of the JOAAP are subject to flooding. Significant portions of the MFG area were inundated during the flood of July 1957, which local residents believe to be the worst in 50 years. Because no other flooding information is available, it is assumed that these particular areas are historically flooded or are within the 100-year flood plain (DAMO04).

Kemery and Doyle Lake are located in the LAP area. Both lakes are utilized for flood control. Kemery Lake is a 27 million gallon impoundment originally constructed in 1942

to provide a source for fire fighting water (ANLA01, AEST01, ARMY01). Kemery dam has sidewalls incorporating a 160 mil vulcanized rubber cover (ACOE01). Doyle Lake is 12 acres and is located on a tributary to Jordan Creek. It was constructed to control surface water runoff. Compounds, such as TNT, RDX, and Composition B, washed out in the southeastern area of the LAP area may have migrated to and impacted Doyle lake sediment (AEST01).

The area west of the TNT lines would flood from TNT ditch overflow and create a pond 0.4 km by 1.8 km. This area continued to flood through 1978. The area remains wet and marshy, and may be heavily contaminated (ARMY01).

The Illinois State Water Survey has determined the 7-day 10-year low flows of Illinois streams, including several of the creeks located within JOAAP. Grant Creek's 7-day 10-year low flow is reported as 0.0 cubic feet per second (cfs) throughout its watershed. Prairie Creek has a 7-day 10-year low flow of 0.0 cfs in its uppermost reaches and 0.10 cfs above the installation's industrial wastewater outfall. This outfall contributed 0.53 cfs to the creek during a 1970 low flow period. The 7-day 10-year low flow in Prairie Creek, just above its confluence with the Kankakee River, is reported as 0.70 cfs. These low flow data, when viewed in the context of the groundwater data presented in the Phase 2 RI may be evidence that (at least under low flow conditions) the streams at JOAAP are losing streams which act as sources of groundwater recharge over much of their length. Locally, however, they may be gaining streams (DAMO11).

2.5.4 Wetlands

National Wetlands Inventory maps of JOAAP developed in 1987 have identified various wetlands areas at and in the vicinity of JOAAP. The majority of the wetlands areas can be classified as Palustrine forested, emergent, unconsolidated bottom or scrub-shrub; or Riverine lower perennial unconsolidated bottom or intermittent streambed. The Palustrine System consists of vegetated wetlands (marshes, swamps, bogs, fens and

prairies. The flora of Palustrine wetlands are dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. The Riverine System includes wetlands and deepwater habitats contained within a channel, except where wetlands are dominated by the flora described above for the Palustrine System (DAMO12).

2.5.5 Soils

The description of soils at JOAAP was adapted from DAMO06. JOAAP contains five distinct soil associations (Figure 2-4). Groups I and II are upland soils, developed over unstratified, calcareous, silty clay loam and glacial till. Groups III, IV, and V are lowland soils and developed west of the escarpment. Group III has developed over 5 feet of medium textured glacial outwash. Group IV lies over 5 feet of medium textured outwash. Group V developed over a stringer of calcareous, porous, loamy gravel outwash.

The five soil associations at JOAAP are described as follows:

Elliott-Ashkum Soil Association (Group I). The surface 12 to 15 inches consists of dark gray silt loam to silty clay loam; the subsoil consists of 15 to 20 inches of firm, brown silty clay. These soils were developed under prairie vegetation and are high in organic matter and water-holding capacity, slightly acidic to neutral, and have low permeability.

Blount Soil Association (Group II). The surface 9 inches of soil consists of dark gray, friable silt loam; the subsoil consists of 21 inches of firm, brown silty clay. This soil group developed under a deciduous hardwood forest and is low in organic matter, water holding capacity, pH (4.7-6.0), and permeability.

Drummer-Brenton Soil Association (Group III). The surface 14 inches consist of black silt loam to silty clay loam; the subsoil consists of 21 to 27 inches of firm, dark gray silty clay loam. These soils developed under marsh and prairie vegetation and are high in

organic matter and water-holding capacity, slightly acidic to neutral, and of moderately low permeability.

Joliet-Millsdale Soil Association (Group IV). The surface 14 inches consist of black, friable silty clay loam; the subsoil consists of 6 to 20 inches of grayish brown, firm silty clay loam. These soils, developed under prairie vegetation, and are high in organic matter and water holding capacity, slightly acidic to neutral, and have moderately low permeability.

Lorenzo-Rodman Soil Association (Group V). These soils consist of seven to 17 inches of dark brown, friable silty-to gravelly loam. They are approximately neutral, moderately high in organic matter, low in water-holding capacity, and have a high permeability.

2.5.6 Geology

The following discussion of JOAAP geology was adapted from previous studies (DAMO22, DAMO06). A more complete discussion of the geology and geologic investigations at JOAAP can be found in those reports.

Previous reports on the hydrogeology of northeastern Illinois, subdivide the rock units of this area into four aquifer systems and two major confining beds. The aquifer systems, from the uppermost downward, are (1) the glacial drift (Pleistocene glacial deposits), (2) shallow bedrock (Silurian dolomites), (3) Cambrian-Ordovician (sandstone and dolomites), and (4) Mount Simon (Cambrian sandstone). Maquoketa Group shales (Ordovician) act as a confining bed between the shallow bedrock aquifer system and the Cambrian-Ordovician aquifer System. Shales of the middle and upper Eau Claire Ordovician Aquifer System, and shales of the middle and upper Eau Claire formation divide the Cambrian-Ordovician aquifer System from the underlying Mt. Simon Aquifer System. Only the glacial drift and shallow bedrock aquifers are at or near the surface at JOAAP. However, water supply wells may reach lower aquifers (DAMO08).

The glacial drift aquifer system, composed of the Henry and Wedron Formations, comprises the uppermost aquifer throughout most of the JOAAP area (Figure 2-1). The Henry formation is the youngest geologic unit at JOAAP and consists of five to 25 feet of glacial outwash. It is approximately 10 percent gravel, 40 percent sand, 35 percent silt, and 15 percent clay with localized stringers of sand and gravel deposited from glacial braided streams. The Wedron Formation is glacial till deposited during the Late Wisconsin Stage of the Pleistocene Epoch. The till is approximately 13 percent fine sand, 44 percent silt, and 43 percent clay. The Wedron formation forms the till upland described in Section 2.5.2. Because of its low yield, the glacial till unit is considered a Class II aquifer (DAMO08).

The shallow bedrock aquifer system at JOAAP consists of undifferentiated Silurian dolomites. In the vicinity of JOAAP, this system is considered a Class I aquifer (DAMO08). Lithologic logs of monitoring wells, located just west of the Henry Formation outcrop at JOAAP, indicate that five to 10 feet of unconsolidated clays, silts, and sands overlie the dolomite. These unconsolidated materials are partly residuum, developed from weathering of the dolomite, and partly alluvium. As indicated in Figure 2-5, the thickness of the Silurian Dolomite at JOAAP varies from approximately 50 feet in the west to approximately 100 feet at the eastern boundary. The Silurian dolomite thins to a feather edge a few miles west of JOAAP, where the Maquoketa Formation outcrops, and it thickens northeast to over 450 feet in the vicinity of Chicago Heights (DAMO22).

The Ordovician Maquoketa group underlies the Silurian dolomite and acts as a confining bed between the shallow bedrock aquifer system and the Cambrian-Ordovician Aquifer System. The Maquoketa Group is composed primarily of plastic shales with interbedded limestone and dolomite (Figures 2-5 and 2-6). Interbedded carbonate rocks are more common in the upper portion of the group, while the base of the Maquoketa has a greater

proportion of shale. The Maquoketa Group is approximately 150 feet thick in the vicinity of JOAAP (DAMO08).

The Cambrian-Ordovician Aquifer System is the most important source of ground water in northeastern Illinois. It consists primarily of sandstone and dolomite, with some limestone and shale. The Galena-Platteville dolomite and Glenwood-St. Peter sandstone are rock units within the Cambrian-Ordovician Aquifer (Figures 2-5 and 2-6). Separating the Cambrian-Ordovician Aquifer from the underlying Mt. Simon Aquifer System is the Eau Claire Formation, consisting of shale and siltstones. The Eau Claire Formation and the Mt. Simon Aquifer System are not shown in the figures (DAMO22, DAMO08).

Northeastern Illinois is on a structural high called the Kankakee Arch, located between the Michigan Basin to the northeast and the Illinois Basin to the south. The regional dip is to the east and south at approximately 10 feet per mile. An anticlinal axis trending northeast-southwest passes through the western portion of JOAAP. This anticline is opposite to the trend of other anticlines and synclines in the region (DAMO22).

The principal fault zone in the region, the Sandwich Fault Zone, trends northwest-southeast and passes through the eastern portion of the plant. This is a gravity fault, with the northern block being the upthrown block. Northwest along the fault, where the Sandwich Fault is known to be fully developed, a series of parallel faults are present in a zone up to 10 miles wide on either side of the main fault. Structural contour maps indicate that vertical displacement of the fault increases with depth in the vicinity of the plant. Displacement is approximately 100 feet on top of the Eau Claire Formation but is approximately 50 feet at the top of the Glenwood-St. Peter sandstone. The Sandwich Fault Zone may locally restrict groundwater flow; however, potentiometric contour maps do not indicate any regional effects (DAMO22).

A review of 1939 aerial photographs showed a system of linear patterns of differing soil coloration or vegetation type and density. Near JOAAP, these lineations are believed to

represent bedrock fractures. As shown in Figure 2-7, there are two major lineation trends northwest-southeast and northeast-southwest; the fractures trending northwest are more numerous than those trending northeast. The depths of the fractures are unknown; however, it is probable that they do not extend through the plastic shales of the Maquoketa Groups, because these shales reportedly seal fractures in underlying carbonate rocks. Consequently, fractures within the shales themselves are expected to be self-sealing. The fracture traces vary from approximately 600 feet to slightly over 2.5 miles long; however, most of them are on the order of 2,000 feet long (DAMO06).

2.5.7 Hydrogeology

Monitoring well locations are shown in Figure 2-8. The horizontal component of groundwater flow in the glacial drift and shallow bedrock aquifer systems is predominantly westward, toward major surface water drainage features. Locally, however, this flow direction is modified by the larger streams in the area (DAMO22).

The available hydrologic data was derived from studies and slug tests carried out by various Army contractors. The slug tests have been performed on 38 monitoring wells; 29 wells located in the MFG area and nine wells in the LAP area (DAMO22).

Hydraulic conductivity of the bedrock and overburden at JOAAP has been calculated from various slug tests performed as part of previous studies. The hydraulic conductivity values of the overburden ranged from 1.5×10^{-6} centimeters per second (cm/sec) to 1.8×10^{-2} cm/sec. This range demonstrates the variability of the glacial deposits at the site, which range from clays and silt deposits to gravelly sands in the outwash plain. The average hydraulic conductivity of the overburden was calculated to be approximately 1.7×10^{-3} cm/sec. In comparison, the hydraulic conductivity of the bedrock appeared to be less variable, ranging from 2.0×10^{-4} to 1.6×10^{-3} cm/sec, with an average of approximately 4.9×10^{-4} cm/sec. Slug tests were also performed on wells screened within both overburden and bedrock. The hydraulic conductivity calculated for these

wells appear to be more reflective of the variability of the overburden wells. General statements relating the average hydraulic conductivity of combined wells are not appropriate because the amount of overburden and bedrock screen varies from well to well. The hydraulic conductivity of the overburden generally appears to be greater than bedrock (DAMO22).

The average porosity of soils at JOAAP, as provided by physical testing of the Wedron and Henry Formations, is 35 percent. Using a hydraulic gradient of 0.004 across the entire site and average hydraulic conductivity of 1.7×10^{-3} cm/sec, the average velocity of groundwater in the overburden is 0.06 ft/day (DAMO06).

Groundwater flow in bedrock is calculated using the same equation, although the porosity of the bedrock is estimated to be 0.01, and the average hydraulic conductivity from slug tests in bedrock wells is 4.9×10^{-4} cm/sec. Using these data, the velocity of groundwater within the bedrock is calculated to be approximately 0.06 ft/day (DAMO06).

This approximated velocity should be considered accurate within an order of magnitude estimate at best. The calculation is based on the assumption that the bedrock behaves as a classical porous medium. However, based on observations made during well installation activities, solution cavities were discovered in the shallow dolomite in two wells (MW401 and MW214) and fractures are known to be present. Groundwater flow along such conduits can be much faster than would be indicated by the gradient and bulk hydraulic conductivity. Furthermore, flow through conduits does not obey Darcy's Law and, therefore, is not subject to calculation on this basis. Additionally, the actual porosity of bedrock is only an estimate based on rock type and has not been actually measured at JOAAP. The value used is probably only within a factor of five of the actual value (DAMO06).

Water level measurements collected in November 1991 were used to calculate vertical gradients between the overburden and bedrock for well pairs located throughout JOAAP.

Based on these data, a downward component of flow between the overburden and bedrock is generally present east of the outwash plain. Exceptions are noted in well pairs located adjacent to Prairie Creek in the LAP area, indicating that this creek is an area of shallow groundwater discharge. Another exception was well pair MW166 and MW320 at the TNT-Ditch in the MFG area, where the vertical gradient indicated upward flow and the well pair was observed to be under artesian conditions when the water level was measured (DAMO06).

In contrast, vertical gradients west of the outwash plain were generally considerably lower than those to the east. These western gradients indicated that groundwater tends to follow horizontally within both the overburden and bedrock. It should be noted that west of the outwash plain, the overburden thins to sometimes less than 5 feet thick, and the water table in this area is often encountered at or near the overburden/bedrock contact (DAMO06).

Because the Wedron Formation is composed primarily of silt and clay, this aquifer system is used by only a few wells in the area. However, local precipitation does percolate downward through the glacial deposits as recharge to the underlying shallow bedrock aquifer system. In the vicinity of JOAAP, the shallow bedrock aquifer is recharged directly by rainfall in the area west of the scarp, and by downgradient seepage from the glacial drift aquifer east of the scarp. Specific capacities of wells pumping water from the shallow bedrock aquifer system in Will County vary from 0.1 to 87.6 gallons per minute per foot (gpm/ft) of drawdown and average 13.1 gpm/ft. This average specific capacity is approximately equivalent to a transmissivity of 14,000 gallons per day per foot (gpd/ft) (DAMO06).

The Cambrian-Ordovician Aquifer is recharged directly by rainfall in north-central Illinois where the Maquoketa shale is absent; however, in the vicinity of JOAAP, it may be recharged by vertical leakage through the Maquoketa shale. The vertical leakage is driven by the vertical head difference between the Cambrian-Ordovician aquifer and the

shallow bedrock aquifer, as indicated by the water table elevation surface on Figure 2-9 (DAMO06).

The productivity of the subdivisions of the Cambrian-Ordovician Aquifer increase with depth below the Galena-Platteville dolomites. The most productive subdivision is the Ironton-Galesville sandstone, to which more than half the transmissivity of the Cambrian-Ordovician Aquifer is attributed. The average transmissivity tends toward a lower value (0.00006) over a long period of pumping (DAMO06).

Use of the Cambrian-Ordovician aquifer has been so intense that one study estimates that the potentiometric surface in the vicinity of the plant declined by approximately 300 feet between 1864 and 1958. By 1980 the potentiometric surface had declined by approximately an additional 150 to 250 feet. The heavy pumping from this aquifer has also altered the natural horizontal hydraulic gradient. Groundwater in this aquifer now tends to flow northeast from JOAAP toward centers of pumping near the cities of Joliet and Chicago, instead of flowing to the south or southeast as it did under natural conditions. By late 1980, the major pumping center in Joliet had dewatered all of the Galena-Platteville and portions of the underlying Glenwood-St. Peter sandstone. The effects of this overdrafting of the Cambrian-Ordovician Aquifer are evident at JOAAP, as shown on Figure 2-9. The depression in the potentiometric surface of the Cambrian-Ordovician Aquifer is apparently due to heavy local pumping at or near the installation (DAMO06).

Groundwater from the glacial till is not considered potable without prior treatment due to high levels of naturally occurring anions and metals. This aquifer is currently not ustilized for domestic purposes by residents in the vicinity of JOAAP. The underlying Silurian Dolomite and Cambrian-Ordovician aquifer system both appear to meet the yield requirements for Class I aquifers, although groundwater from the dolomite may require treatment prior to use (DAMO08).

A total of 20 wells for water production currently exist at JOAAP. Fourteen are deep (completed at 1,500 to 1,700 feet); six are shallow (AEST01, AEHA05). A review of the construction methods of ten of the deep wells for the State of Illinois found a common method. The ten wells were installed in 1941 and 1942 (AEST01).

All well borings include a surface casing (22 inch diameter typically) set into the uppermost bedrock unit to seal off unconsolidated deposits. Then, either one or two additional lengths of smaller diameter casing were telescoped into the borings to seal off the upper bedrock aquifer and underlying confining layer (i.e., Maquoketa Shale). The remainder of the boring in most wells is not cased except for a short liner at a depth of approximately 900 feet. Other borings do not have the liner section (AEST01).

All of the pumps have been removed and placed in storage except those for the east and west wells in the LAP area. When the deep well pumps were in place, the pumping capacities ranged from 1,000 to 1,400 GPM each and the pump depths ranged from 450 to 750 feet (AEST01).

2.5.7.1 Groundwater Use

Two deep water supply wells (East Well and West Well) located in the LAP area which provide drinking water to the JOAAP facility are completed at depths of 1,649 and 1,672 feet, respectively (AEHA05, DAMO08). These wells draw water from the deep Cambrian-Ordovician aquifer. During active operations, the MFG area was also supplied with drinking water by deep wells tapping this aquifer. There are several shallower wells at JOAAP that draw (or drew) water from the Silurian dolomite for non-potable uses. Well Numbers 1, 2 and 3 at IR Site L5 were used for industrial water supply for a cement plant operation. Several other wells elsewhere in the LAP area are used by farmers for livestock water. No production wells at JOAAP draw water from the Glacial till (DAMO08).

In 1991, a well survey was conducted as part of the Phase 2 RI for the MFG area. The survey area encompassed approximately a one-mile perimeter around the current JOAAP boundary. The majority of wells identified in the survey (165 of 214) were identified as using shallow groundwater from the Silurian dolomite. For the purposes of this study, wells less than 300 feet in depth were interpreted as utilizing shallow groundwater. The glacial till did not appear to be utilized as a groundwater source. Thirteen of these wells were sampled as part of the Phase 2 RI for the MFG area; the results are summarized in the following section on Groundwater Quality (DAMO08, DAMO16).

2.5.7.2 Groundwater Quality

In general, groundwater from the glacial till and Silurian dolomite is not potable because of extremely high concentrations of naturally occurring minerals and metals. No residential wells are known to be installed in the glacial till. Almost all of the residents with shallow wells in the dolomite purchase bottled water for drinking purposes due to the objectionable taste and odor as well as potential physiological effects from drinking this groundwater. During the well sampling, residents noted that use of the shallow groundwater results in chronic problems with clogged pipes and holding tanks, clogged coffee makers, stained laundry and fixtures. Most well water samples collected during the Phase 2 RI had a sulfur odor (DAMO08).

Table 2-4 presents the maximum concentrations of various analytes found in the background glacial till and Silurian dolomite aquifer samples during the Phase I and Phase 2 RIs, as well as concentrations detected during residential well sampling. All of these analytes were found to naturally exceed either the Illinois Class I Groundwater standards, Federal ARARs, or have a negative effect on groundwater use. As indicated in Table 2-4, concentrations of many anions and metals are naturally high in groundwater from the glacial till. Particularly high levels were detected for:

- calcium,
- iron (present at levels above the SMCL),
- magnesium,
- sodium (present at levels above the DWEL),
- water-soluble nitrate/nitrite (present at a concentration above the MCL and the Illinois Class I Groundwater standard),
- water-soluble sulfur (present at a concentration above the SMCL and the Illinois Class I Groundwater standard).

These elevated concentrations of metals and anions may be considered background concentrations for JOAAP when evaluating cleanup levels for site remediation (DAMO08).

2.5.7.3 Areas Of Contaminated Groundwater

Based on the findings of the RIs conducted at JOAAP, several areas of contaminated groundwater have been identified at both the MFG area and LAP areas. The extent of contamination is limited to shallow groundwater present within either the glacial till of the upper portion of the Silurian dolomite and in most instances the contamination is extremely localized. Table 2-5 summarizes the analytes detected at elevated levels at each of the study sites within the MFG area and LAP areas (DAMO08).

2.6 Biological Resources

JOAAP represents the ancient natural community of an Illinois tall-grass prairie. It lies within two subdivisions of the Grand Prairie Natural Division: the Grand Prairie Section and Kankakee Sand Area Section. The latter is differentiated from the Grand Prairie Section by having sandy soils that were deposited during the Kankakee torrent. Prior to settlement approximately 86 percent of the installation was described as prairie while 14

percent as forested and less than one percent as swamp. Land use practices which were predominately agricultural have drastically changed the pre-settlement conditions. Less than one percent of original prairie remains. The upland woods were removed years ago and replaced with such crops as corn, soybeans, and alfalfa. Areas less suitable for cropping due to soil type, rockiness or drainage, were used for grazing (IDOC01).

General resources for aquatic habitats consist primarily of the four creeks (Jackson, Grant, Prairie, and a branch of Jordan Creek) which discharge to the Des Plaines or Kankakee River. The National Wetlands Inventory (1987) identified various wetland areas at and in the vicinity of JOAAP. The majority of wetlands are classified as Palustrine Forested, emergent, unconsolidated bottom or scrub-shrub, or riverine lower perennial unconsolidated bottom or intermittent streambed. The Palustrine System consists of vegetated wetlands--marshes, swamps, bogs, fens and prairies. The flora of Palustrine wetlands are dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. The Riverine system includes wetlands and deep water habitats contained within a channel, except where wetlands are dominated by the flora described above for the Palustrine system (IDOC01).

Some of the natural resource areas of JOAAP are: Drummond Dolomite Prairie, TNT Wetland, Hof Woods, Star Grove, and Prairie Creek Woods. The Grant Creek Prairie Nature Preserve is located between the Des Plaines Wildlife Conservation Area and the western boundary of JOAAP. Its size, about 119 acres, makes it one of the largest tracts of wet prairie remaining in Illinois. It is under the control of the Illinois Nature Preserves Commission. Other natural areas may also exist, some of which have been degraded by agricultural practices. The presence of natural areas and management of disturbed areas containing Eurasian grasses and old crop lands is considered essential to the maintenance of animals species at JOAAP (IDOC01).

A total of 401 plants species have been identified for the JOAAP and JATA, including 347 native Illinois species. Although this is a large number of species it is not considered

a complete listing. Two federal candidates and Illinois State endangered insect species, were identified at JOAAP: the Eryngium root borer moth (*Papipema eryngii*) and red-veined leafhopper (*Aflexia rubranura*). Nineteen other insects were located in the JOAAP/JATA listing. It is believed that additional surveys will identify more species. A total of 32 fish and mussel species were identified. No species of federal or Illinois state concern were identified. Previous studies have identified 27 mammals at JOAAP. A total of 108 avian species are known to breed at JOAAP. JOAAP provides important breeding and wintering habitat for these species. The extensive grasslands at JOAAP provide a large prey base for these species during both the breeding season and winter. Few other areas in the state provide as large a foraging habitat as the JOAAP/JATA complex for breeding and wintering of raptors. The scattered pine plantations of the JOAAP provide roosting sites for some of these raptors. Cooper's hawks and great-horned owls have also used these pine plantings (IDOC01).

2.7 Cultural Resources

In 1985, an archaeological overview report summarized the results of a limited reconnaissance survey at Joliet arsenal. This survey identified two known prehistoric and one historic archaeological site. Additionally, at least two and possibly five potential historic sites and 250 potential historic resources were documented at Joliet arsenal (AEST01).

A known historic archaeological site, Reed Cemetery, is located in the eastern portion of the MFG area (AEST01).

Two known prehistoric sites have been identified by the Illinois Archaeological Survey and are located on the MFG area. Both sites date from an unknown prehistoric period. One site is from the Woodland or Mississippian Cultural Period. The Woodland Period dates from approximately 1000 B.C. to A.D. 1000, and has been characterized by the use of large burial mounds, a widespread trading network, a period of population increase and

ceramic technology improvements. The Mississippian period contiguous with the Woodland Period began at about A.D. 1000 and lasted until A.D. 1673 when the first Frenchmen visited the area. This colonization is characterized by large fortified towns, flat-topped platform mounds, and chiefdom-level socio-political organization (AEST01).

A second limited archaeological study performed at JOAAP in 1987 defined two additional cultural resources. One site in particular, contains not only a buried archaic component but also a late prehistoric mortuary facility with body bags et al., named Plenenuk Mounds. This archaic period dates from the end of the Pleistocene Era to about 1000 BC and is traditionally defined as an Aceramic Period (AEST01).

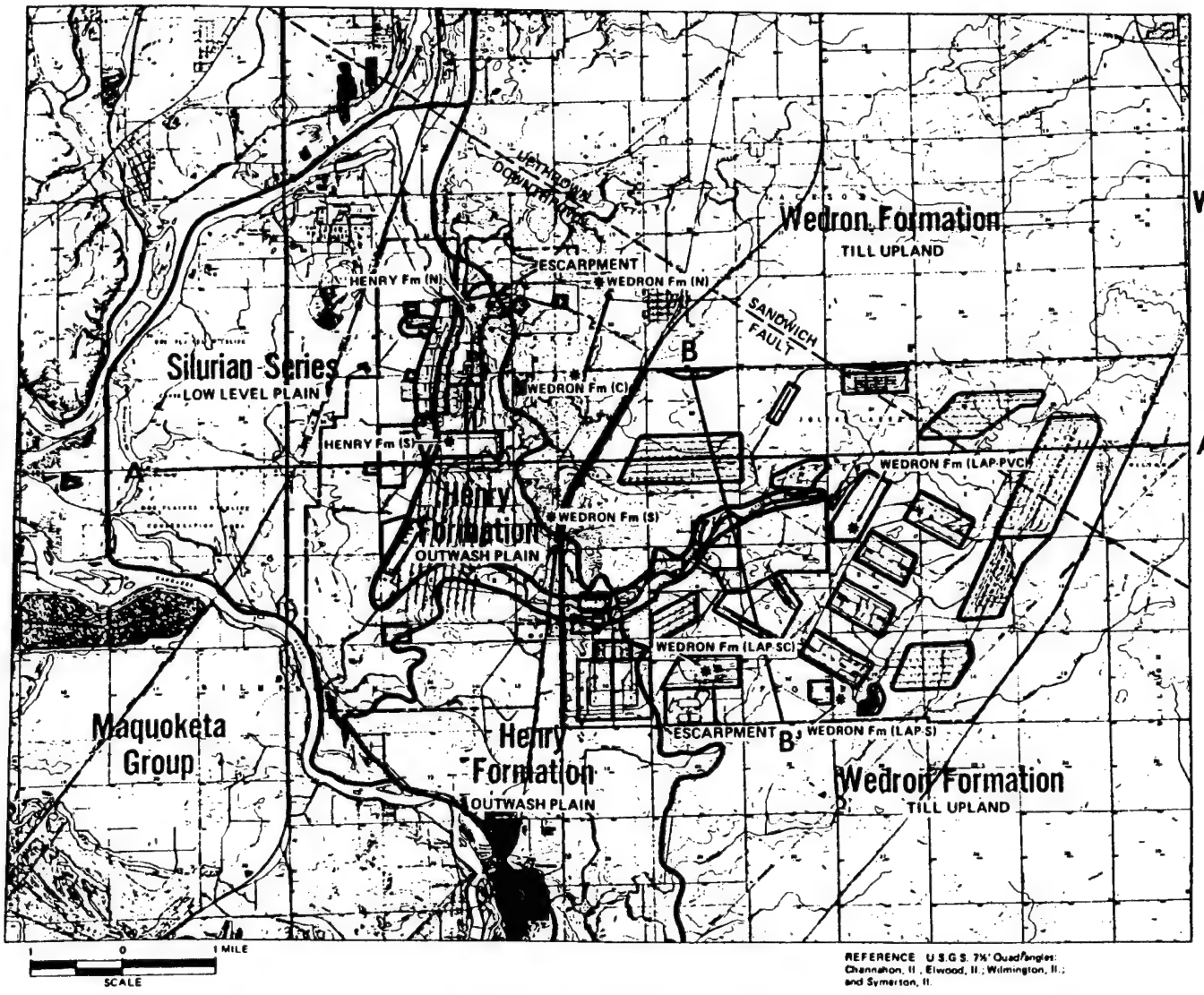
A second site is from the Upper Mississippian Langford Tradition Period. This period is characterized by ceramic jars decorated with incised or trail designs with punctuation and having a distinctive black grit temper. Both of these sites are located on the MFG area (AEST01).

In a limited survey conducted by Midwest Archeological Research Services Inc., 27 prehistoric and 11 historic sites were located. The historic sites are thought to be part of Reeds Grove, the earliest pioneer settlement in Will County (ACOE01).

One of the main historical features near the JOAAP is the Illinois and Michigan (I&M) Canal National Heritage Corridor (NHC). The MFG area lies along the eastern boundary of the NHC. The I&M Canal was the first official designated NHC in the United States. The I&M Canal, constructed in the 1800's to provide a link between the Great Lakes and the Illinois River, was officially opened in 1849. The Canal consisted of 15 locks, three dams, four aqueducts, and provided transportation that was cheaper than overland horse and wagon. The Canal was in use for two decades until the railroads provided faster transportation. In 1890 the Chicago Sanitary and Ship Canal replaced the I&M Canal between Chicago and Lockport for both waste removal and barge traffic. The I&M was

completely abandoned as a waterway in 1933 when the present waterway system, was completed (AEST01).

USACOE is currently conducting a survey of all the historic and prehistoric sites at JOAAP.



Legend:

A——A' Orientation of Cross Section

Wedron Formation — Geological Unit

TILL UPLAND — Topographic Subdivision

* Soil Sample Location for Physical Testing

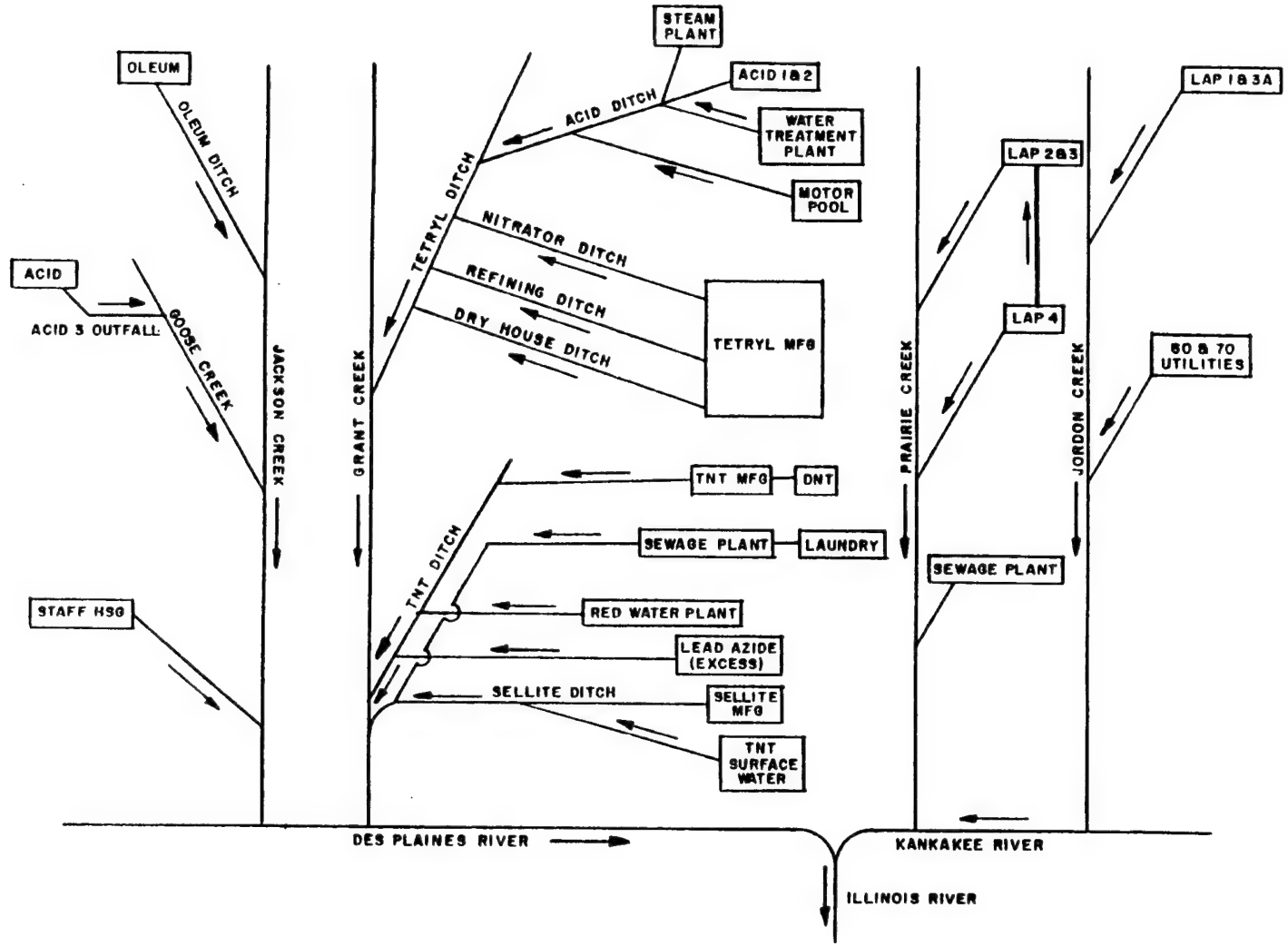
N

Source: Dames & Moore

Figure 2-1
Topographic & Geologic Map

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation



Source ARMY01

Figure 2-2
Schematic of Wastewater and the System of Receiving Streams

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation

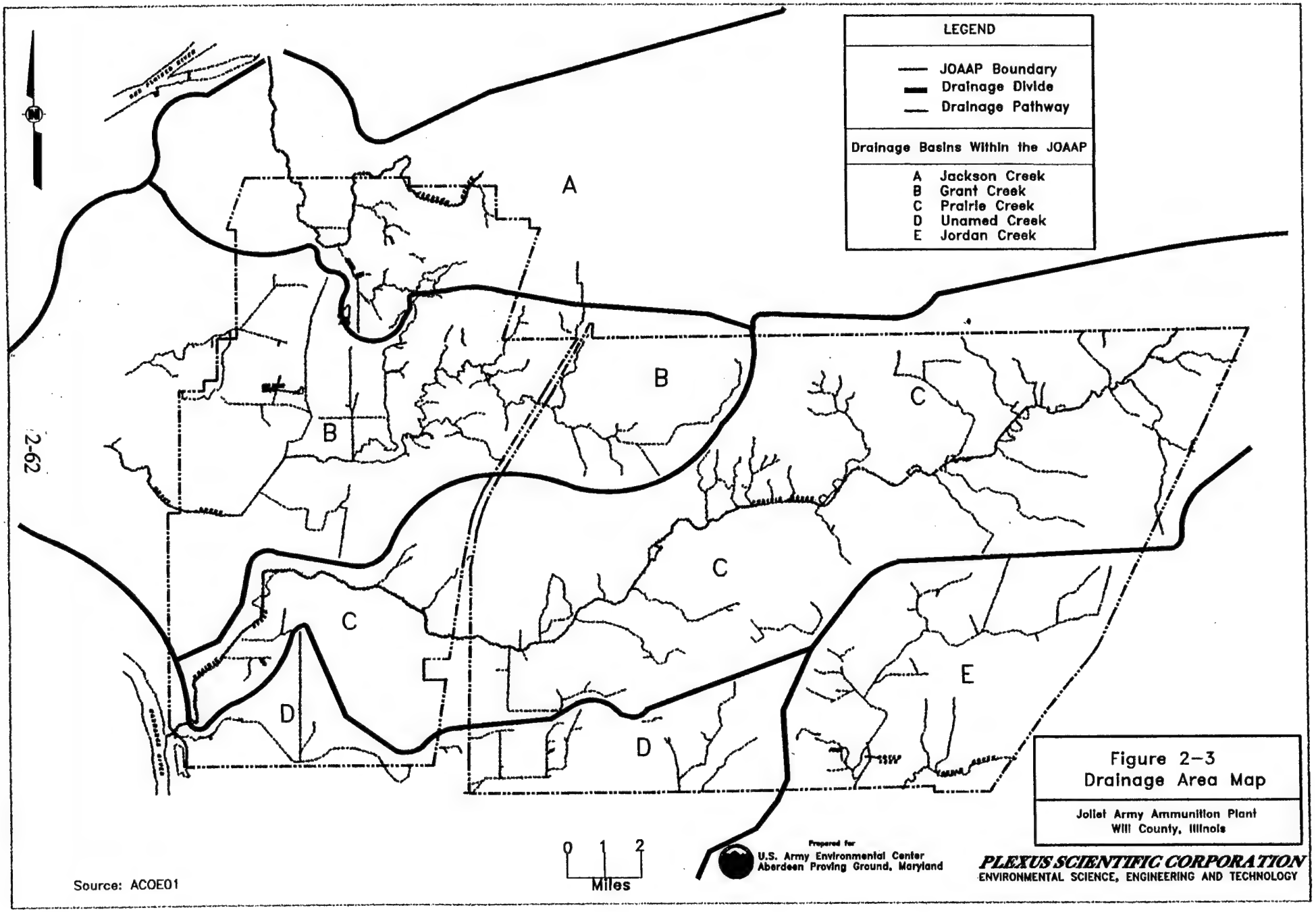


Figure 2-3
Drainage Area Map

Joliet Army Ammunition Plant
Will County, Illinois

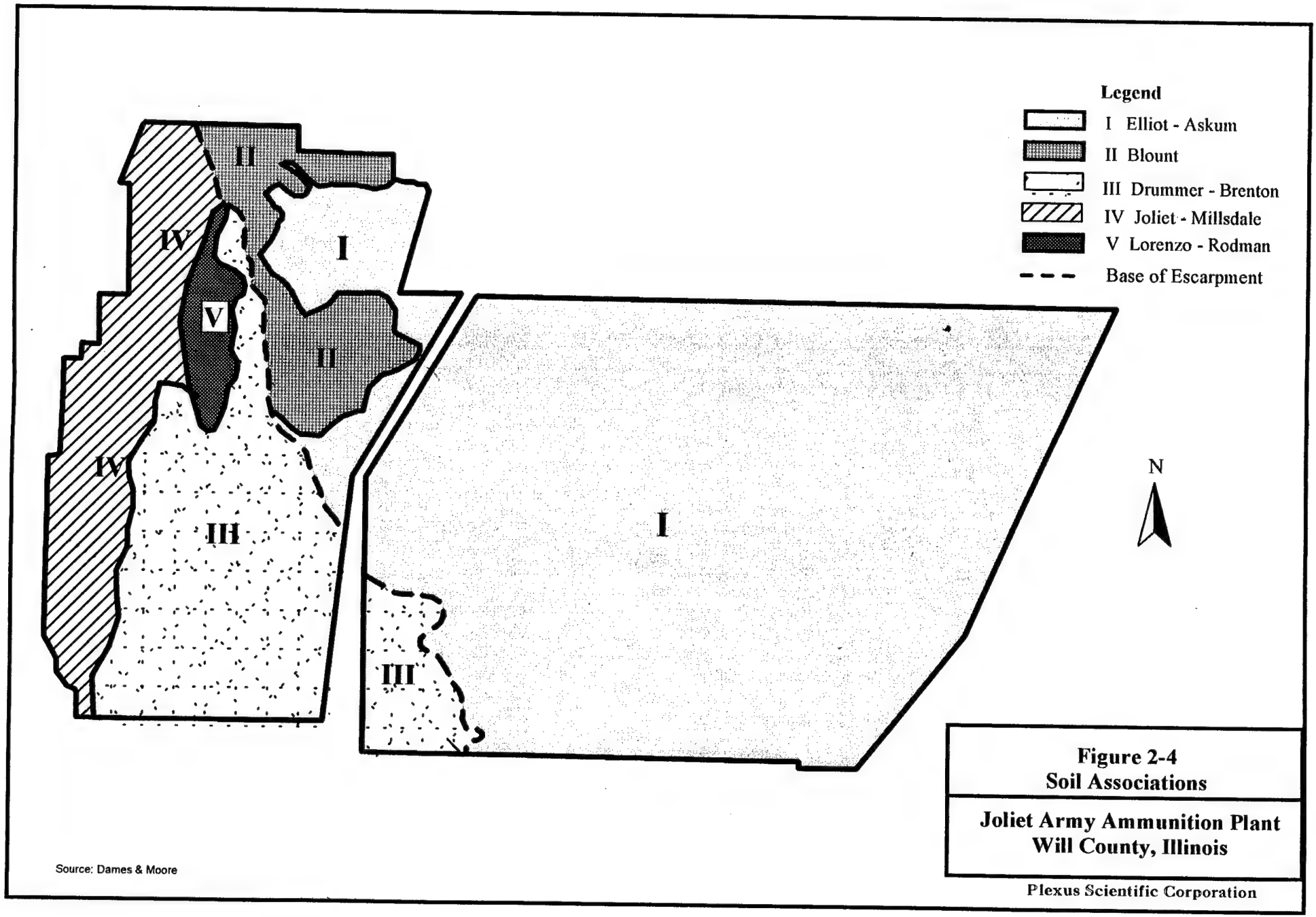


Figure 2-4
Soil Associations

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation

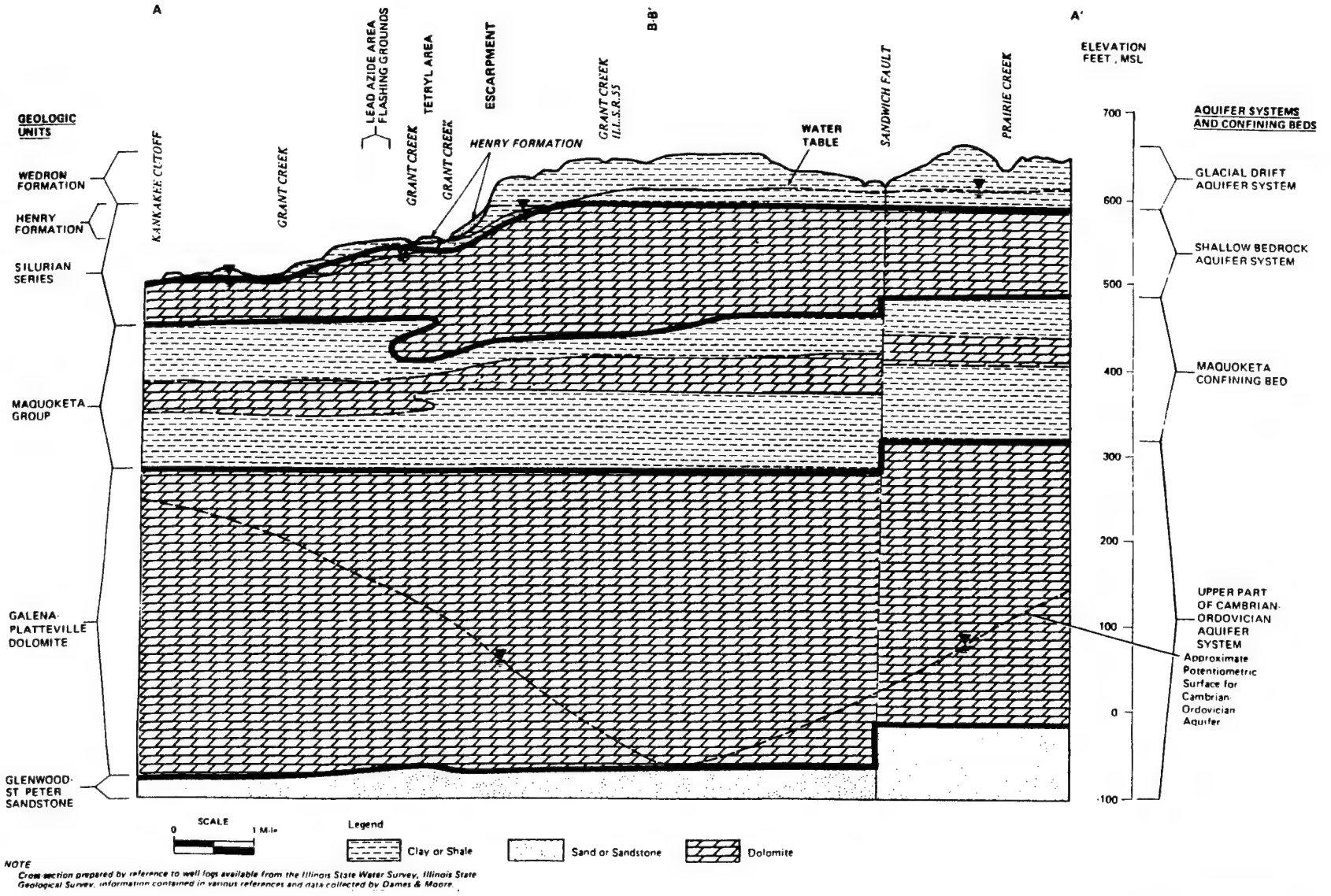
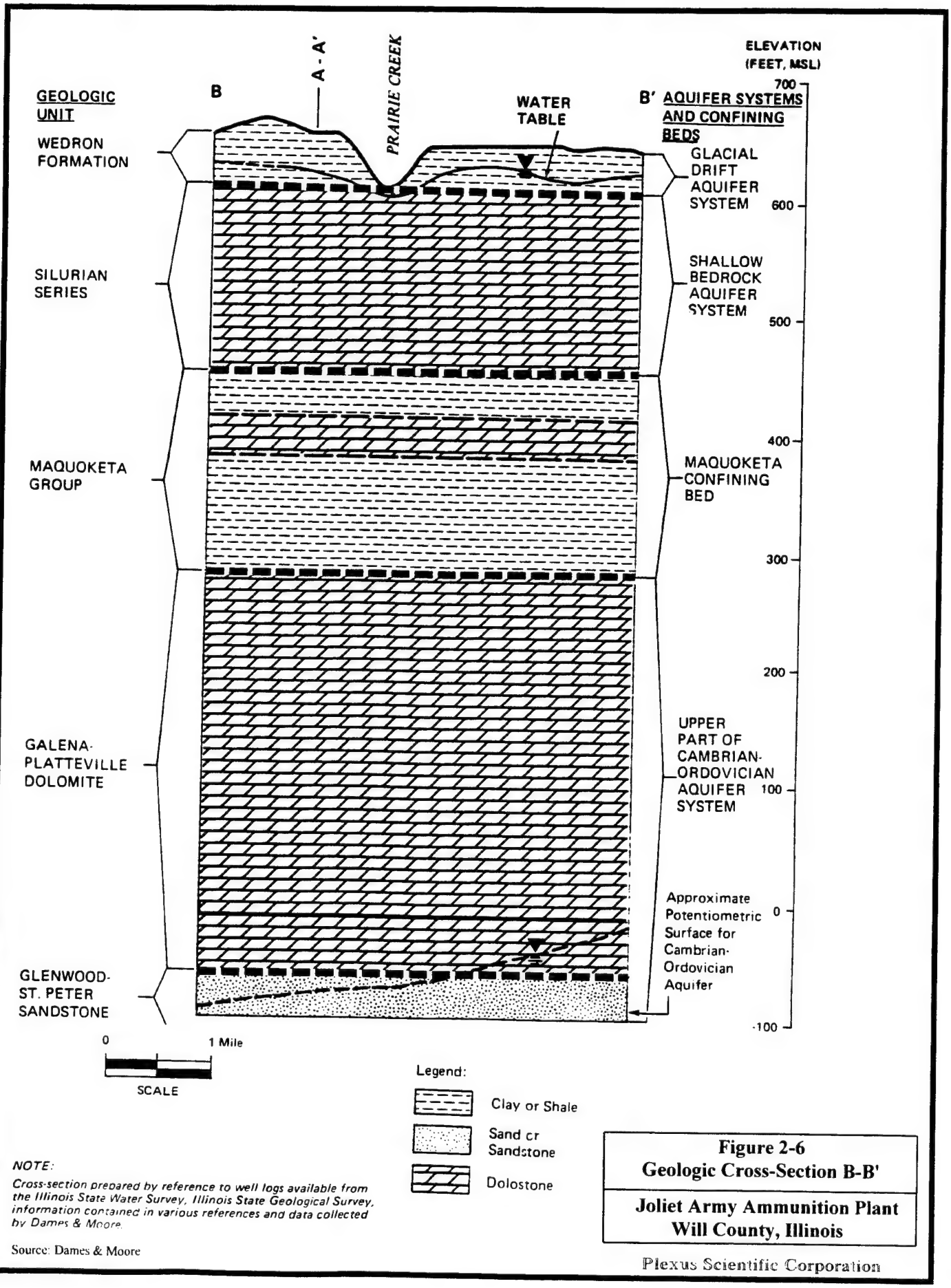


Figure 2-5
Geologic Cross-Section A-A'

Joliet Army Ammunition Plant
Will County, Illinois

Source: Dames & Moore

Plexus Scientific Corporation



NOTE:

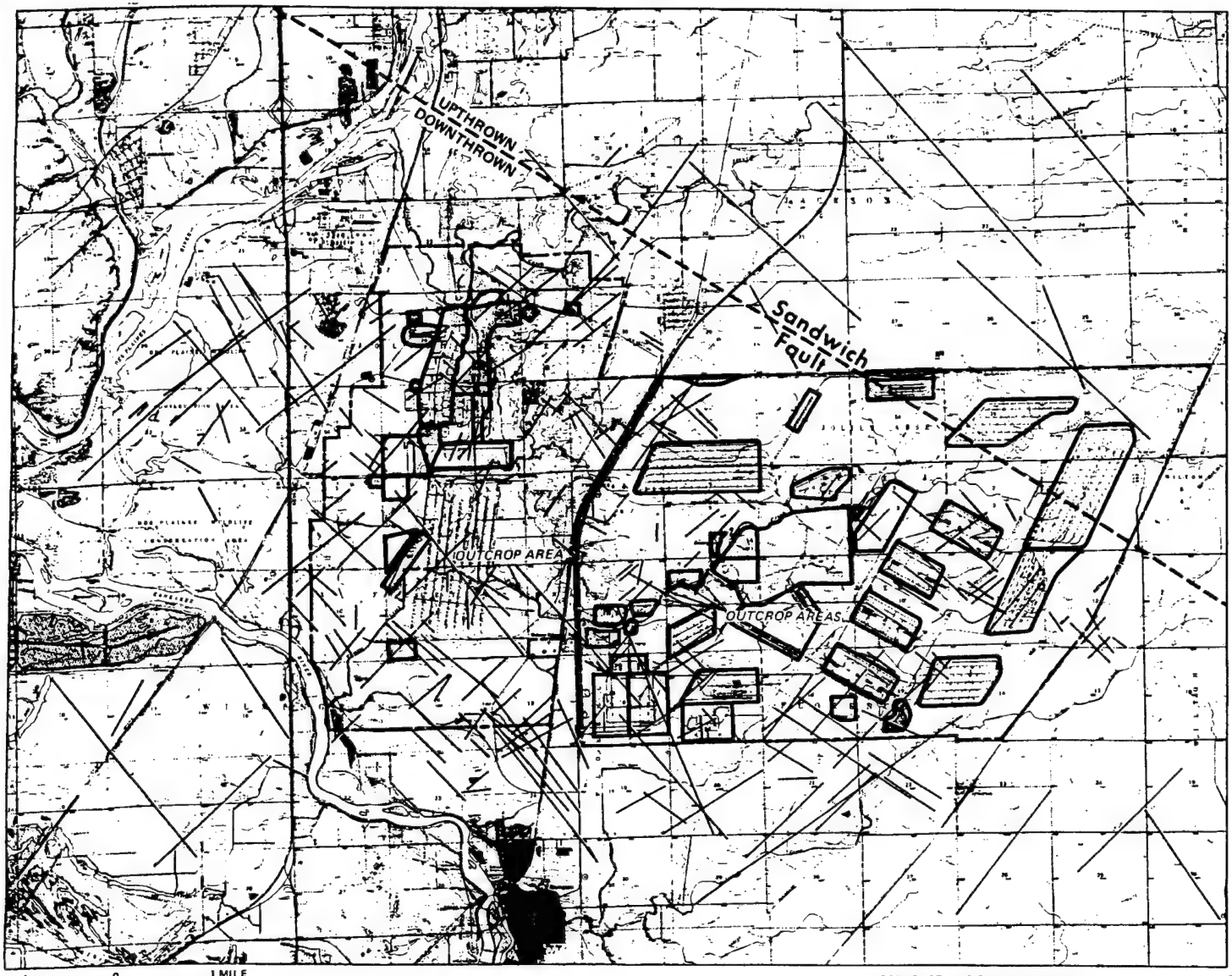
Cross-section prepared by reference to well logs available from the Illinois State Water Survey, Illinois State Geological Survey, information contained in various references and data collected by Dames & Moore.

Source: Dames & Moore

Figure 2-6
Geologic Cross-Section B-B'

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation



REFERENCE U.S.G.S. 7½' Quadrangles: Channahon, Ill.; Elwood, Ill.; Wilmington, Ill.; and Symerton, Ill.

Source: Dames & Moore

Figure 2-7
Results of Fracture Trace Analysis

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation

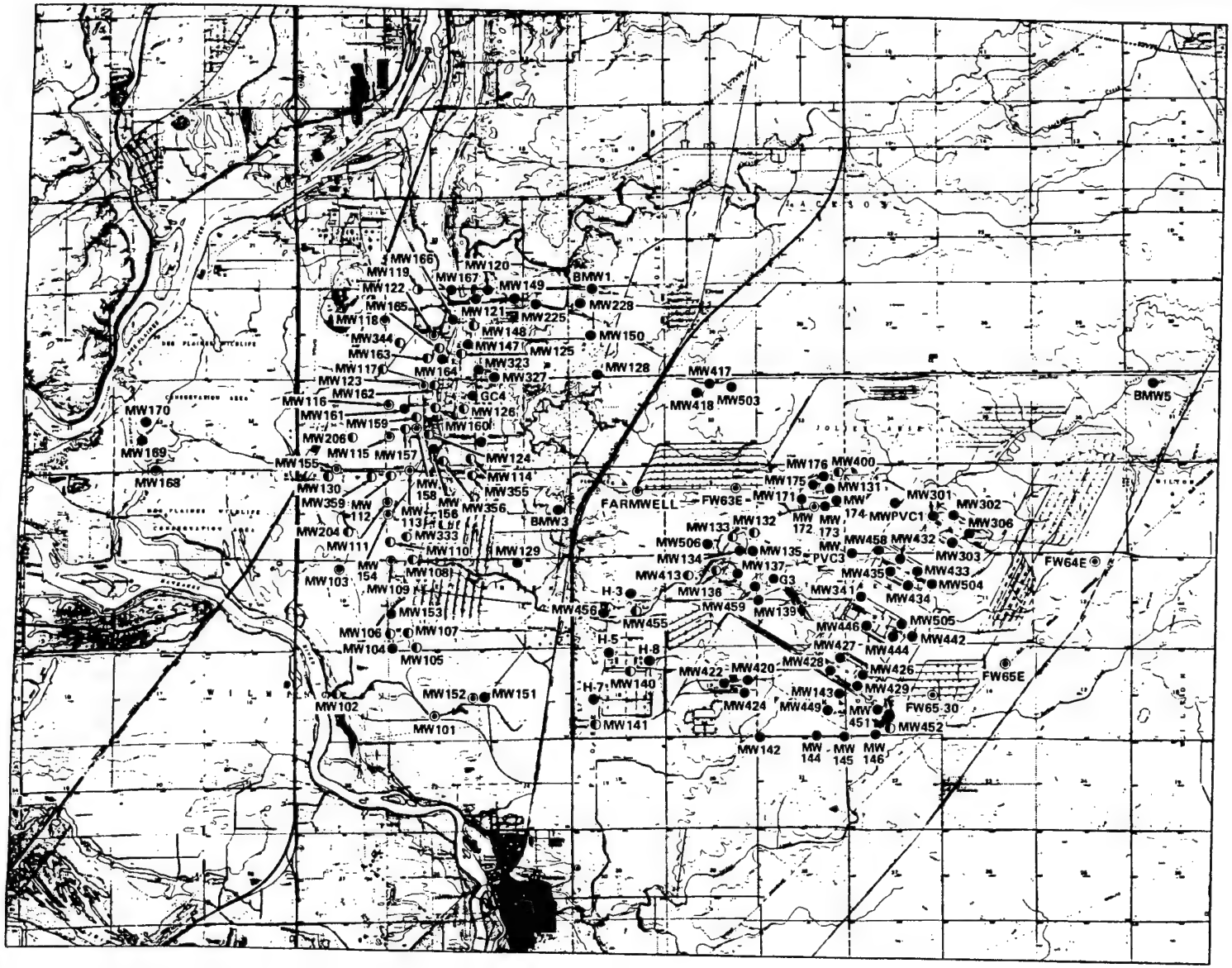


Figure 2-8
Locations of Monitoring Wells Used for Preparation of Water Table Map

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation

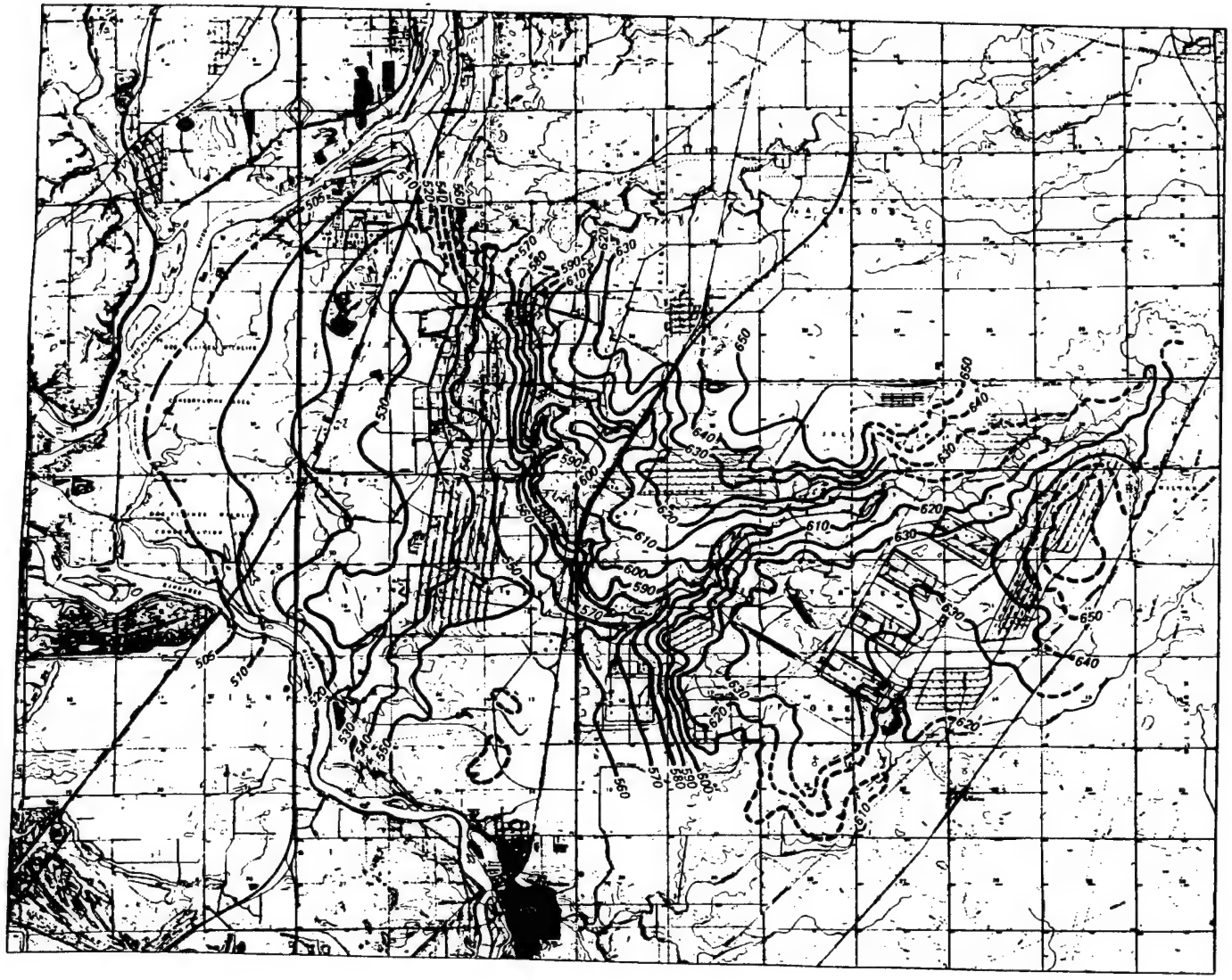


Figure 2-9
Water Table Contour Map

Joliet Army Ammunition Plant
Will County, Illinois

Plexus Scientific Corporation

TABLE 2-1
NON-AGRICULTURAL OUTGRANTS
JOAAP, WILL COUNTY, ILLINOIS

Grantee's Name	Contract Number	Expiration Date	Purpose of Outgrant	Remarks
Illinois Bell	JAAP042-10	October 23, 2002	Telephone line right of way	Telephone line
Commonwealth Edison	JAAP042-14	July 26, 2006	Electric line right of way	Electric and telephone
Northern Illinois Gas Co.	042-16	October 28, 2006	Pipeline right of way	8-inch gas
State of Illinois Adjutant General	042-17		Road right of way	Road
Amoco Pipeline Company	JAAP042-3		Pipeline right of way	Gas
Public Service Co. of Northern Illinois	JAAP042-6		Electric line right of way	Electric transmission lines
State of Illinois Adjutant General	JAAP042-8		Road right of way	Extended roadway
State of Illinois Adjutant General	JAAP042-9		Road right of way	Road
Midwestern Gas	DA-11-032-ENG-7087	August 13, 2009	Pipeline right of way	Gas
State of Illinois Adjutant General	DA-11-932-ENG-7118		Road right of way	
Midwestern Gas	DA-11-032-ENG-8162	August 13, 2009	Pipeline right of way	
Northern Illinois Gas Co.	DA-11-032-ENG-8958	May 30, 2011	Pipeline right of way	Gas
Northern Illinois Gas Co.	DA-11-032-ENG-12867	July 12, 2015	Pipeline right of way	Gas pipelines
Mobil Oil Corp.	DACA2217106018		Pipeline right of way	
Will County Highway	DACA23-2-68-142		Road right of way	Road
Illinois Bell Telephone Co.	DACA45-2-71-6113	May 18, 2021	Electric line right of way	Buried cables
Natural Gas Pipeline Co.	DACA45-2-73-6026	September 7, 2022	Pipeline right of way	42-inch pipeline
Mobil Oil Corp.	DACA-45-3-71-6169		Pipeline right of way	18-inch oil pipeline
Illinois Division of Criminal Investigation	DACA27-1-85-1	November 30, 1995	Storage	Building 61-2
Mobil Pipe Line Co.	DA-11-032-ENG-1732	February 3, 2003	Pipeline right of way	Crude petroleum, oil, gas & by-products pipe line
Illinois Bell	DA-11-032-ENG-6962	March 24, 2010	Telephone line right of way	Underground cable
Arco Pipeline Co.	DA-11-032-ENG-7088	September 23, 2001	Right of way	Cathodic protection system
Arco pipe Line Co.	JAAP042-2	September 23, 2001	Pipeline right of way	Gas

TABLE 2-1
NON-AGRICULTURAL OUTGRANTS
JOAAP, WILL COUNTY, ILLINOIS

Grantee's Name	Contract Number	Expiration Date	Purpose of Outgrant	Remarks
State of Illinois Adjutant General	JAAP042-13		Road right of way	Road
Commonwealth Edison	DACA45-2-73-6063	January 10, 2024	Electric line right of way	Electric transmission lines
Commonwealth Edison	DACA45-2-74-6075	April 23, 2023	Electric line right of way	Electric transmission lines
Commonwealth Edison	DACA45-2-75-6171	December 28, 2025	Electric line right of way	Electric transmission lines
Commonwealth Edison	DACA45-2-72-6121		Electric line right of way	Electric transmission lines
Northern Illinois Gas Co.	DACA45-2-73-6009	August 14, 2022	Pipeline right of way	Gas
Department of Justice, FBI	DACA45-4-79-6244	August 31, 1994	Other	Building 27-22
Department of the Treasury Bureau of Alcohol, Tobacco, and Firearms	DACA27-4-82-4	May 31, 1992	Other	Storage, Buildings 811-1 through 4
RSIX Management Inc.	DACA27-1-88-57	June 24, 1998	Storage	Storage of empty rail cars, Groups 25, 63, and 66A
National Starch-Chem Co. Custom Farm Seed Division	DACA45-1-82-6062	April 30, 1993	Storage	SA 2 Buildings 66-81, through 84
National Starch-Chem Co.	DACA27-1-84-55	May 31, 1994	Storage	Magazines for storage (10 total)
Amoco Pipeline Company	JAAP-042-1		Other	Crude petroleum, oil, gas & by-products pipe line
Scheer James	DACA27-2-94-9	October 31, 1998	Other	Power poles for electrical line
Department of the Interior Fish and Wildlife Service	DACA27-4-87-16	September 30, 1997	Other	Building 27-3
Commonwealth Edison	DACA27-2-88-75	July 19, 2029	Electric line right of way	40 year term with 5 year renewals
U.S. Forest Service	DACA27-4-95-79			Buildings 62-9, 74-2, 74-2B, and Brown Circle Area

Source: LEAS01

TABLE 2-2
RCRA WASTES GENERATED
JOAAP, WILL COUNTY, ILLINOIS

RCRA Waste	Quantity	Information Source	RCRA Waste	Quantity	Information Source
US Army Joliet Ammo Plt Uniroyal (USEPA IL7213820460)					
D002	-	Notification	D003	-	Notification
F001	-	Notification	F003	-	Notification
K044	-	Notification	K045	-	Notification
K047	-	Notification	P120	-	Notification
U002	-	Notification	U019	-	Notification
U105	-	Notification	D002	999999.999	Part A
D003	111.99	Part A	F001	27.216	Part A
K044	830.496	Part A	K045	4.314	Part A
K047	114437.836	Part A	P120	9.07200	Part A
U002	24.129	Part A	U019	46.192	Part A
U105	0.816	Part A	-	-	-
Talley Defense Systems JAAP GP3 (USEPA ILD984774463)					
D003	-	Notification	F001	-	Notification
F003	-	Notification	-	-	-
Alliant Techsystems Inc. (USEPA IL0210090049)					
D001	-	Notification	D003	-	Notification
K044	-	Notification	K045	-	Notification

Source: database searches (refer to Section 3.0 for databases searched)

Note: Units for quantities were not specified in the database records.

D001 ignitable hazardous wastes are those wastes which have a flashpoint of less than 140 degrees Fahrenheit as determined by a pensky-martens closed cup flash point tester. another method of determining the flash point of a waste is to review the material safety data sheet, which can be obtained from the manufacturer or distributor of the material. lacquer thinner is an example of a commonly used solvent which would be considered as ignitable hazardous waste.

D002 A waste which has a pH of less than 2 or greater than 12.5 is considered to be a corrosive hazardous waste. sodium hydroxide, a caustic solution with a high pH, is often used by industries to clean or degrease parts. hydrochloric acid, a solution with a low pH, is used by many industries to clean metal parts prior to painting. when these caustic or acid solutions become contaminated and must be disposed, the waste would be a corrosive hazardous waste.

D003 A material is considered to be a reactive hazardous waste if it is normally unstable, reacts violently with water, generates toxic gases when exposed to water or corrosive materials, or if it is capable of detonation or explosion when exposed to heat or a flame. one example of such waste would by waste gunpowder.

F001 The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005, and still bottoms from the recovery of these spent solvents and spent solvent mixtures.

F003	The following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005, and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
K044	Wastewater treatment sludges from the manufacturing and processing of explosives
K045	Spent carbon from the treatment of wastewater containing explosives
K047	Pink/red water from TNT operations
P120	Vanadium oxide V205, vanadium pentoxide
U002	Acetone (I), 2-propanone (I)
U019	Benzene (I,T)
U105	benzene, l-methyl-2,4-dinitro-, 2,4-dinitrotoluene

TABLE 2-3
RECORDS FROM ARMY COMPLIANCE TRACKING SYSTEM
JOAAP, WILL COUNTY, ILLINOIS

Record Number	Regulatory Requirement	Date of Action	Action Type	Date of Status	Enforcement Authority	Findings	Milestones
1	CWA	8/22/88	INOV	11/29/93	Federal	Inadequate drinking water standards Raise well levels	Complete project Complete modification Receive state approval Pending Resolved
3	CWA	4/9/90	INOV	6/30/90	State	Failure to submit groundwater monitoring annual report	Resolved
8	CWA	11/19/93	INOV	4/26/94	Federal	Continued non-compliance of the NPDES permit The piping was still connected to the tanks	Disconnecting piping from tanks relieving requirement to list tanks in SPCC plan Update SPCC plan Resolved
9	CWA	5/21/92	LS	9/1/93	Other	Continued non-compliance of the NPDES permit	Turned situation over to the DOA legal office Signed settlement - resolved
13	CWA	11/25/91	LS	9/1/93	Other	Violations of NPDES permit	Notice of intent to file law suit vs. JAAP Signed settlement - resolved
7	RCRA_C	12/10/91	INOV	11/29/93	State	Storing hazardous waste not specified in Part A Part A permit not submitted for new Hazerdous Waste in storage Facility operating records do not contain closure costs Facility annual report for 1988, 1989 & 1990 not available	Attend Pre-enforcement hearing for discussion of violations Resolved
10	RCRA_C	1/19/94	INOV	2/15/94	State	Emergency equipment list not up to date Failed to have date of accumulation on waste contract Hazardous waste containers not clearly marked 1991 & 1992 manifest not available for review	Letter from Illinois EPA determining JAAP returning to compliance Comply with all state requirements Resolved
2	RCRA_D	9/21/88	INOV	7/12/90	Federal	?	Joliet contacted state and this issued in error Discussed at IAG meeting of June 1989 Now Completed...Date: 3/90 on 7/12/90
5	RCRA_D	7/2/90	WL	9/26/90	State	Inadequate depth daily cover Improper handling of waste at landfills	By July 17, 1990 - sent report to state on violations Letter from Uniroyal to COR JAAP on 6 corrections Reinspection occured and found all adequated. Completed
6	SDWA	11/12/91	INOV	11/29/93	State	Water supply does not have acceptable cross-connection End of vent pipe not downturned No records to record radioactive material removed from drinking water Chlorination equipment not completely isolated	Have licensed plumer approve cross-section control program Install a reduced pressure zone backflow Downturn vent pipes Begin keeping records of radioactive materials removed from water. Isolate chlorine equipment Resolved
4	TSCA	6/10/89	INOV	9/30/90	Federal	TSCA Violation	EPA Region V notification of needed Uniroyal letter says all corrected Resolved
14	TSCA	11/3/94	INOV	12/5/94	Federal	Failure to provide quarterly inspection reports on PCB transformers Failure to provide proof that PCB transformers registered with fire department	Provide copies of inspection reports as required Provide proof that PCB transformers were registered with fire depatment Resolved

Source: ACTS01
INOV=Inst. Notice of Violation
LS=Law Suit
WL=Warning Letter

TABLE 2-4
GROUNDWATER QUALITY PARAMETERS, µg/l
JOAAP, WILL COUNTY, ILLINOIS

	Concentrations in Area			Groundwater Quality Standards		Effects on Groundwater Use	
Analyte	Maximum Glacial Till Facility-Wide Background Concentration	Maximum Dolomite Facility-Wide Background Concentration	Maximum Residential Well Concentration	Illinois Class I Standard	Federal Standard	Concentration Range That Affects Use	Effect
Antimony	7.32	7.14	Not Detected	None	6[a]		No information available
Calcium	158,000	150,000	101,000	None	None	25,000-50,000	Principle cause of hardness, boiler scale, and deposits in hot water heaters. Inhibits sudsing.
Iron	634	532	4,590	5,000	300 [b]	>300	Stains laundry and fixtures. More than 100 µg/l precipitates upon exposure to air; causes turbidity and imparts objectionable taste and color to foods and drinks. Is objectionable in many industrial processes.
Magnesium	104,000	74,000	50,100	None	None	25,000-50,000	Principle cause of hardness, boiler scale, and deposits in hot water heaters. High concentration have a laxative effect.
Manganese	198	13.1	89.1	150	50 [b]	>50	Stains laundry and fixtures. More than 200 µg/l precipitates upon oxidation; causes undesirable tastes, deposits on food during cooking, fosters growth in filters and water lines. Is objectionable in many industrial processes.
Sodium	71,500	81,000	394,000	None	2,000 [c]	69,000 (irrigation) 20,000-170,000 (health)	May affect persons with certain medical conditions. In combination with calcium and magnesium may be detrimental to certain irrigated crops.
Water-soluble nitrate/nitrite	178	360,000	1,900	10,000	10,000 [c]		Water with more than 100,000 µg/l is bitter tasting and may cause physiological distress. Water from shallow wells containing more than 45, 000 µg/l has been reported to cause methemoglobinemia in infants.
Water-soluble sulfate	15,000,000	8,300,000	211,000	400,000	50,000 [b]	300,000-400,000 (taste) 600,000-1,000,000 (laxative)	Gives water a bitter taste, has a laxative effect at higher concentrations. Forms hard scale in combination with calcium.

Note: Shading indicates analytes that exceeded Illinois Class I or Federal groundwater standards and/or contribute to non-potability of groundwater.

Source: DAMO08

[a] Maximum Contaminant Level

[b] Secondary Maximum Contaminant Level

[c] Drinking Water Equivalent Level

TABLE 2-5
SUMMARY OF ANALYTES DETECTED AT ELEVATED LEVELS IN SHALLOW GROUNDWATER
JOAAP, WILL COUNTY, ILLINOIS

Study Area	Analyte	Maximum Value (µg/l)
M1	Antimony	31
	Magnesium	252,000
	Silver	200
	Sodium	15,000,000
	Sulfate	24,000,000
	Total Phosphorous	200
M2	Sulfate	1,600,000
M3	1,1-Dichloroethane	3.87
	1,2-Dichloroethene	0.932
	Benzene	15.8
	Toluene	392
	Benzyl alcohol	3.6
	2-Methylphenol	15.5
	4-Methylphenol	10.8
M5	1,3,5-Trinitrobenzene	1.91
	2,4,6-TNT	16.7
	2,4-DNT	0.136
	2,6-DNT	5.35
	Tetryl	67
M6		
North Plume	1,3,5-Trinitrobenzene	240
	1,3-Dinitrobenzene	8.76
	2,4,6-TNT	2,600
	2,4-DNT	3,200
	2,6-DNT	2,700
	2-Nitrotoluene	21,000
	RDX	52.7
	Tetryl	34.5
	Nitrobenzene	81.8
	Nitrate/nitrite	35,000
Middle Plume	2,4-DNT	0.701
	2,6-DNT	0.456
South Plume	2,4,6-TNT	21.6
	2,4-DNT	25
	2,6-DNT	38
	2-Nitrotoluene	5.75
	RDX	1.09
	Nitrobenzene	11.4
M7	2,4-DNT	2.05
	2,6-DNT	1.11
	RDX	21.3
	1,1,1-Trichloroethane	4.95
	1,1-Dichloroethene	1.93
	1,2-Dichloroethene	0.641
	Tetrachloroethylene	3.96
	Nitrate/nitrite	2,200
	Sulfate	1,100,000
M8	1,1,1-Trichloroethane	50
	1,1-Dichloroethane	27.5
	Nitrate/nitrite	500
M10		
West Tank Farm	Benzene	20
	Ethylbenzene	286
	Toluene	19,600
	Xylenes	4,720
East Tank Farm	Benzene	2
	Ethylbenzene	3
	Tolueene	20,000
	Xylenes	500
M11	Magnesium	290,000
	Nitrate/nitrite	1,700
	Sulfate	2,100,000
M12	Sulfate	680,000
M13	Nitrate/nitrite	1,100

Source: DAMO08

TABLE 2-5
SUMMARY OF ANALYTES DETECTED AT ELEVATED LEVELS IN SHALLOW GROUNDWATER
JOAAP, WILL COUNTY, ILLINOIS

Study Area	Analyte	Maximum Value (µg/l)
L1	1,3,5-Trinitrobenzene	1,610
	2,4,6-TNT	2,250
	2,4-DNT	2.01
	2,6-DNT	8.54
	1,3-Dinitrobenzene	5
	Tetryl	58.6
	RDX	56.5
	HMX	43.8
	Nitrate/nitrite	80,800
L2		
Burning Pad	HMX	110
	RDX	640
South Oil Pit	1,2-Dichloroethane	1.81
	Alumnium	651
	Iron	1,080
	Nitrate/nitrite	1,200
L3		
Burning Cage	RDX	22.2
	HMX	2.94
	Nitrate/nitrite	440
Bermed Area	RDX	77.9
	HMX	10.6
	Nitrate/nitrite	1,900
	Lead	9.33
L4	1,1,1-Trichloroethane	0.713
	1,1,2-Trichloroethane	1.5
	1,2-Dichloroethane	4.87
L5	1,1-Dichloroethane	2.34
	Alumnium	233
	Antimony	6.74
	Manganese	622
L6	Chlorobenzene	1.92
	Benzyl alcohol	1.28
	Butylbenzyl phthalate	6.32
	Arsenic	13.4
L7	Nitrate/nitrite	820
	Sulfate	750,000
L8	Nitrate/nitrite	1,100
	Manganese	347
	Silver	3.74
L10	1,3-Dinitortoluene	1.57
	RDX	2.27
	1,2-Dichloroethane	2.52
	Nitrate/nitrite	430
	Phosphate	5,000
	Iron	5,430
	Lead	4.77
	Manganese	2,260
	Zinc	877
L14	2,4,6-TNT	1.15
	Nitrobenzene	1.08
	HMX	130
	RDX	840
L18 & L19	Nitrate	15,300
	Chromium	14.6
	Manganese	439

Source: DAMO08

3. SCREENING METHODOLOGY

This PAS report identifies the presence of site contamination, including the general type and quantity of hazardous substances, and the period of time over which storage, release, or disposal of such hazardous substances took place on the property, to the extent such information was available from existing records. It also describes areas of environmental concern.

3.1 Approach

3.1.1 Development of Study Sections

In order to facilitate data collection, management, and retrieval, JOAAP was divided into 95 study sections (Figure 3-1 and Table 3-1). Site information was collected and is referenced by these study sections. Study sections were developed based upon the following considerations:

- boundaries had to be readily identifiable in the field;
- boundaries had to correspond closely with future property transfers;
- boundaries had to be of a manageable size for survey;
- all of the JOAAP property must be encompassed by a study section;
- no land area could fall into more than one section, and;
- sections had to correspond with existing IRP study areas.

Therefore, section boundaries were designated at the center of roads, streams and fences and many of the boundaries lie along township section lines. Once in the field, it was found that a number of the roads chosen for study boundaries on the LAP area no longer exist. However, the location of the former road was generally easily discernible (i.e., based upon tree lines). It should be noted that an accurate land survey of the study areas or the transfer parcels has not been performed.

The previously identified IRP study areas and their nomenclature were retained. PAS study sections are labeled by a letter and number. For sections in the LAP area these labels are L100 to L122 and for sections in the MFG area these labels are M99 to M117. For consistency, existing study areas in the MFG area had an "M" added to their label. Thus, all IRP study area designations are a letter followed by two digits. The letter identifies whether the area is in the MFG or LAP area and the digits provide the study area number. The boundaries correspond with those currently being used by the IRP.

3.1.2 Records Search

A review of readily available records was conducted to identify documentation of potential environmental concerns relating to the excess parcel or for nearby properties which may impact the excess parcel. The records search focused on review of files and records at USAEC at Aberdeen Proving Ground, Maryland, files maintained in storage at JOAAP in buildings 61-7, 703-5, and 74-3 and records contained at the National Archives in College Park, Maryland. Records, files, maps and other documents reviewed are presented in the bibliography (Section 6). It is assumed that all the documents obtained from government sources contain accurate information.

In accordance with the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments (E-1527-94) a search of reasonably ascertainable government records for the excess parcel and within the ASTM specified radii was conducted. Table 3-2 lists the state and federal databases searched and Table 3-3 presents a list of nearby facilities found in the databases searched.

3.1.3 Aerial Photograph Analysis

A 1986 report prepared by the USEPA Environmental Photographic Interpretation Center (EPIC) presents the findings of a review of historic aerial photographs of JOAAP.

Photographs from 1939, 1946, 1952, 1954, 1961, 1967, 1973, 1974, 1978, and 1979 were obtained and reviewed by EPIC. This study identified 24 areas of concern at JOAAP (BICO01). The JOAAP areas of concern became the IR study areas and the findings of the EPIC report were used to target IRP areas of investigation. The findings of the EPIC review have been incorporated into the PAS.

3.1.4 Interviews and Agricultural Lessee Questionnaires

Several informal interviews of past and current JOAAP employees were conducted. These interviews concerned specific areas of interest identified from the site reconnaissance and records review.

Approximately 16,700 acres of land at JOAAP are under Agricultural leases for crops and grazing. Questionnaires were mailed to all current agricultural lease holders in order to help identify any unusual conditions or potential environmental concerns. The responses to the questionnaires were used to expand upon the site reconnaissance and identify other areas of potential concern. The questionnaire sent to the lessees can be found in Appendix A.

3.1.5 Site Reconnaissance

A limited site reconnaissance involving a driving tour of the facility and its perimeter, and random survey by vehicle and on foot through each section of the property was conducted to field verify information found in the document review and to identify potential environmental concerns. Within the land for transfer to the Department of Agriculture, 152 buildings were visually inspected (Table 3-4). These buildings were selected as a representative sample from groups of similar buildings. Specific findings of the site reconnaissance may be found in Appendixes B, C and D.

A reconnaissance of the base perimeter was conducted to evaluate adjacent property uses that may contribute to environmental contamination detected on site. Typical property uses that can cause environmental contamination on adjacent properties include dry cleaners, gas stations, and industrial plants. The findings of the perimeter survey are presented in Section 4.1.21.

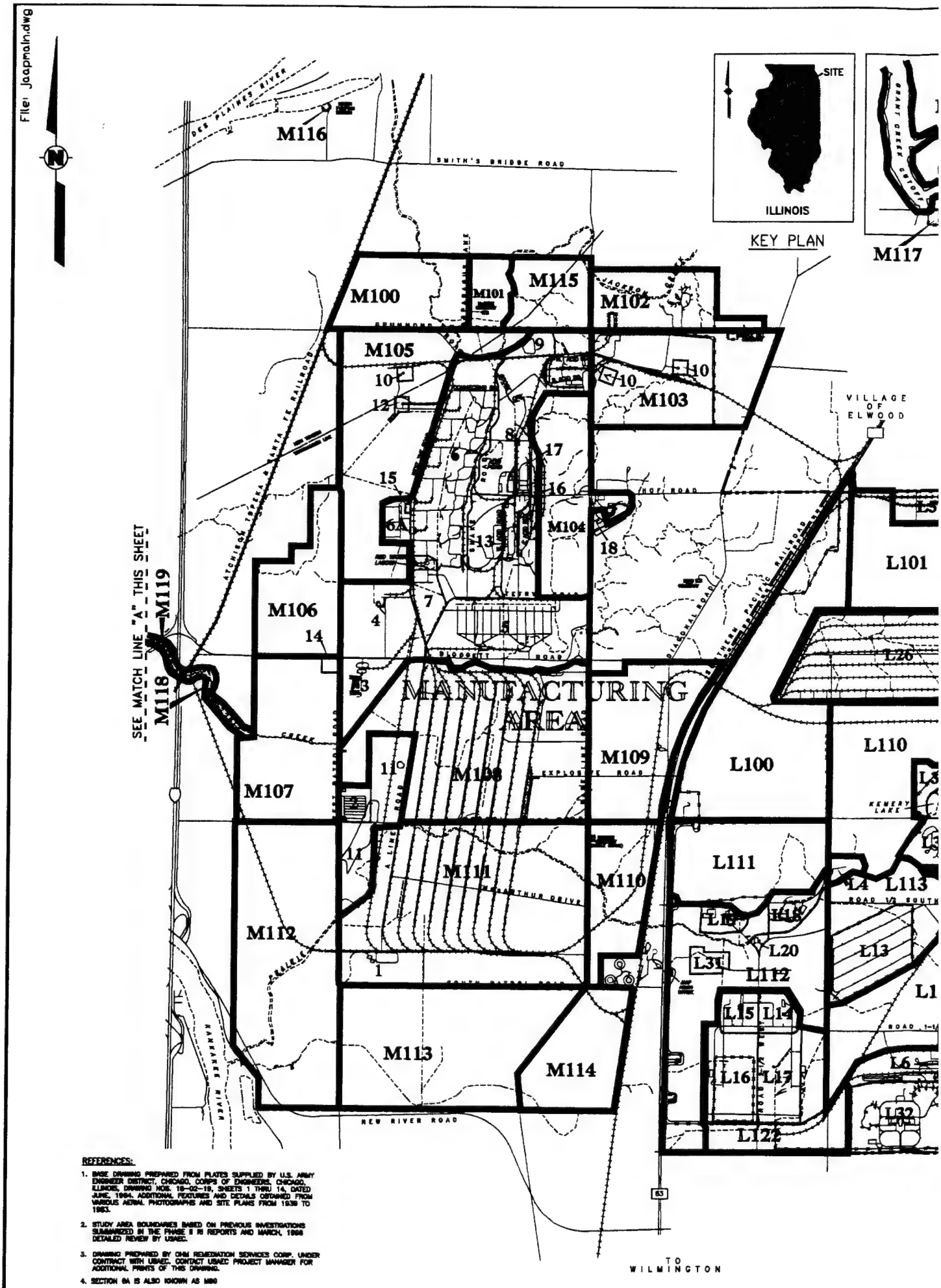
3.1.6 Historic Land Use Analysis

An analysis of historic land use patterns was conducted to identify those uses that may have resulted in, or contributed to, environmental contamination or other environmental concerns. The analysis was conducted through informal interviews and review of site plans, historical documents and aerial photographs. Historic analysis revealed that a number of structures have been demolished. The demolished buildings are included in Appendix D, to the extent that such information was available.

3.2 Data Management

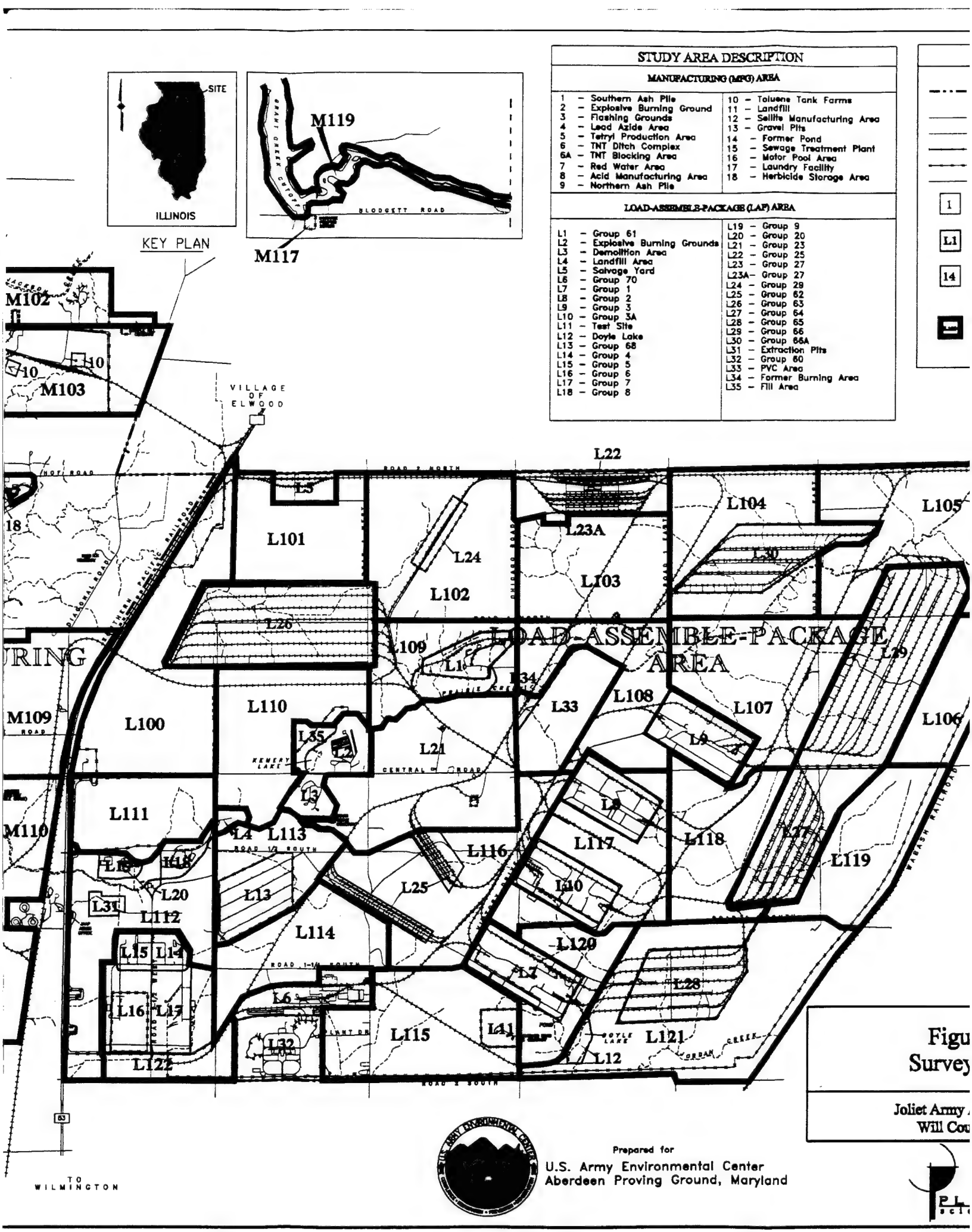
Environmental concerns at JOAAP were evaluated facility-wide and findings were compiled into an electronic database. The information contained in the database for each study section and building is presented as profile in Appendixes B and C. The profile information is used to summarize the nature, magnitude and extent of environmental contamination or concern, if any, on the use of property considered for transfer.

Specific environmental concerns identified during the PAS are listed and defined with regard to the potential for environmental contamination in Section 4. Further definition of these concerns is provided in Appendixes B, C and D.



REFERENCES:

1. BASE DRAWING PREPARED FROM PLATES SUPPLIED BY U.S. ARMY ENGINEER DISTRICT, CHICAGO, CORPS OF ENGINEERS, CHICAGO, ILLINOIS, DRAWING NOS. 16-02-19, SHEETS 1 THRU 14, DATED JUNE, 1994. ADDITIONAL FEATURES AND DETAILS OBTAINED FROM VARIOUS AERIAL PHOTOGRAPHS AND SITE PLANS FROM 1939 TO 1983.
2. STUDY AREA BOUNDARIES BASED ON PREVIOUS INVESTIGATIONS SUMMARIZED IN THE PHASE II RI REPORTS AND MARCH, 1988 DETAILED REVIEW BY USAEC.
3. DRAWING PREPARED BY OHM REMEDIATION SERVICES CORP. UNDER CONTRACT WITH USAEC. CONTACT USAEC PROJECT MANAGER FOR ADDITIONAL PRINTS OF THIS DRAWING.
4. SECTION 6A IS ALSO KNOWN AS M99


SITE
ILLINOIS
KEY PLAN
M119
BLODGETT ROAD
M117
STUDY AREA DESCRIPTION
MANUFACTURING (MFG) AREA
1 – Southern Ash Pile
2 – Explosive Burning Ground
3 – Flashing Grounds
4 – Lead Azide Area
5 – Tetryl Production Area
6 – TNT Ditch Complex
6A – TNT Blocking Area
7 – Red Water Area
8 – Acid Manufacturing Area
9 – Northern Ash Pile
10 – Toluene Tank Farms
11 – Landfill
12 – Sellite Manufacturing Area
13 – Gravel Pits
14 – Former Pond
15 – Sewage Treatment Plant
16 – Motor Pool Area
17 – Laundry Facility
18 – Herbicide Storage Area
LOAD-ASSEMBLE-PACKAGE (LAP) AREA
L1 – Group 61
L2 – Explosive Burning Grounds
L3 – Demolition Area
L4 – Landfill Area
L5 – Salvage Yard
L6 – Group 70
L7 – Group 1
L8 – Group 2
L9 – Group 3
L10 – Group 3A
L11 – Test Site
L12 – Doyle Lake
L13 – Group 68
L14 – Group 4
L15 – Group 5
L16 – Group 6
L17 – Group 7
L18 – Group 8
L19 – Group 9
L20 – Group 20
L21 – Group 23
L22 – Group 25
L23 – Group 27
L23A – Group 27
L24 – Group 28
L25 – Group 62
L26 – Group 63
L27 – Group 64
L28 – Group 65
L29 – Group 66
L30 – Group 66A
L31 – Extraction Pits
L32 – Group 80
L33 – PVC Area
L34 – Former Burning Area
L35 – Fill Area
M102
M103
M109
M110
VILLAGE OF ELWOOD
ROAD 2 NORTH
ROAD 1/2 SOUTH
ROAD 1-1/2 SOUTH
ROAD 2 SOUTH
HOT ROAD
DIAGONAL ROAD
CENTRAL ROAD
KEMERY LAKE
PRAIRIE CREEK
DOYLE LAKE
JORDAN CREEK
WABASH RAILROAD
LOAD-ASSEMBLE-PACKAGE AREA
L101
L102
L103
L104
L105
L106
L107
L108
L109
L110
L111
L112
L113
L114
L115
L116
L117
L118
L119
L120
L121
L122
TO WILMINGTON
Figu
Survey
Joliet Army
Will Cou
Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

STUDY AREA DESCRIPTION

MANUFACTURING (MFG) AREA

1 – Southern Ash Pile
2 – Explosive Burning Ground
3 – Flashing Grounds
4 – Lead Azide Area
5 – Tetryl Production Area
6 – TNT Ditch Complex
6A – TNT Blocking Area
7 – Red Water Area
8 – Acid Manufacturing Area
9 – Northern Ash Pile
10 – Toluene Tank Farms
11 – Landfill
12 – Sellite Manufacturing Area
13 – Gravel Pits
14 – Former Pond
15 – Sewage Treatment Plant
16 – Motor Pool Area
17 – Laundry Facility
18 – Herbicide Storage Area

LOAD-ASSEMBLE-PACKAGE (LAP) AREA

L1 – Group 61
L2 – Explosive Burning Grounds
L3 – Demolition Area
L4 – Landfill Area
L5 – Salvage Yard
L6 – Group 70
L7 – Group 1
L8 – Group 2
L9 – Group 3
L10 – Group 3A
L11 – Test Site
L12 – Doyle Lake
L13 – Group 68
L14 – Group 4
L15 – Group 5
L16 – Group 6
L17 – Group 7
L18 – Group 8
L19 – Group 9
L20 – Group 20
L21 – Group 23
L22 – Group 25
L23 – Group 27
L23A – Group 27
L24 – Group 29
L25 – Group 62
L26 – Group 63
L27 – Group 64
L28 – Group 65
L29 – Group 66
L30 – Group 66A
L31 – Extraction Pits
L32 – Group 60
L33 – PVC Area
L34 – Former Burning Area
L35 – Fill Area

LEGEND

- JOLIET ARMY AMMUNITION PLANT BOUNDARY
- ROAD OR PARKING AREA
- SEASONAL ROAD OR TRAIL
- RAILROAD
- FENCE
- DRAINAGE FEATURE
- [1] MANUFACTURING AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- [L1] LOAD–ASSEMBLE–PACKAGE AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- [14] HISTORICAL STUDY AREA BOUNDARY AND IDENTIFICATION
- PAS SURVEY SECTION BOUNDARY

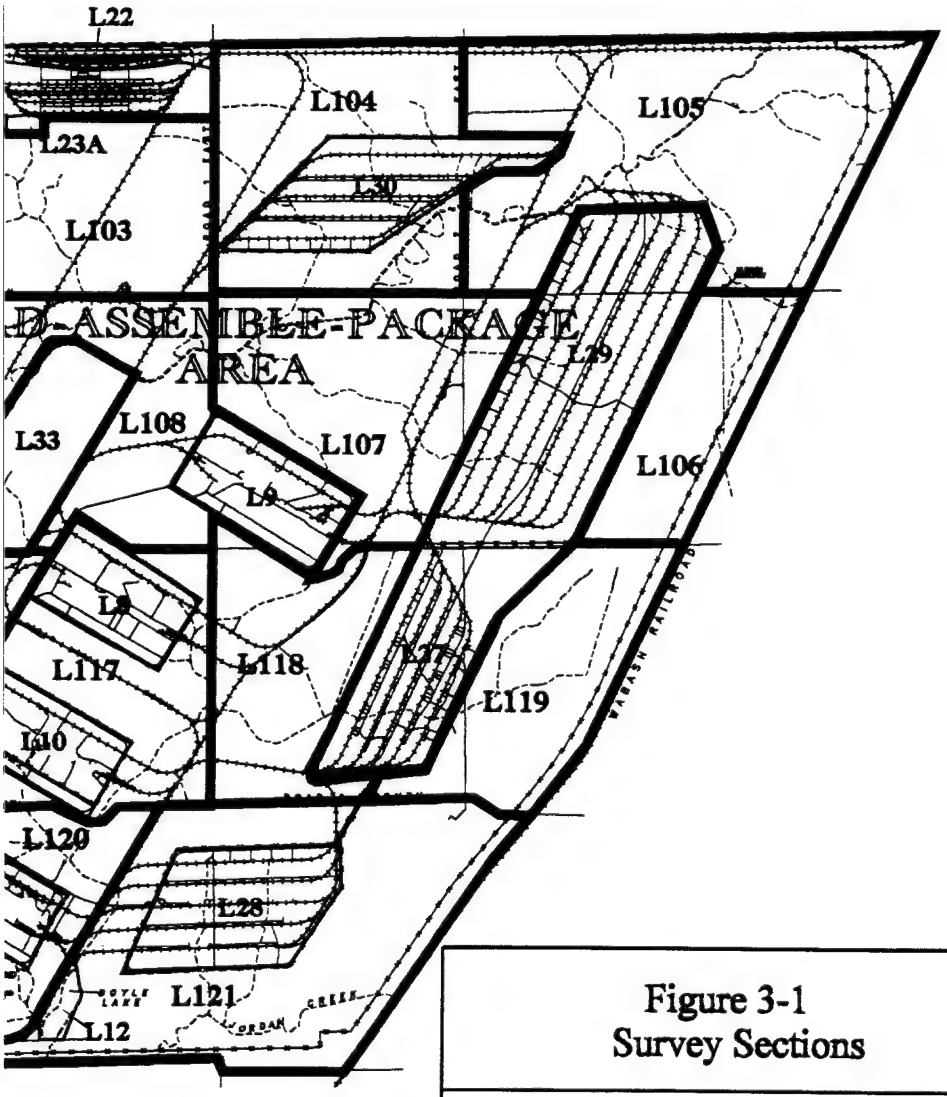


Figure 3-1
Survey Sections

Joliet Army Ammunition Plant
Will County, Illinois

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

PLEXUS scientific

TABLE 3-1
SURVEY SECTION FUTURE OWNERS
JOAAP, WILL COUNTY, ILLINOIS

Section	Section Description	Future Owner		
		USDA (Tallgrass Prairie)	State of Illinois (Industrial Parks)	Will County (Landfill)
L1	Group 61	•		
L2	Explosive Burning Ground	•		
L3	Demolition Area	•		
L4	Landfill Area	•		
L5	Salvage Yard	•		
L6	Group 70		•	•
L7	Group 1	•		
L8	Group 2	•		
L9	Group 3	•		
L10	Group 3A	•		
L11	Test Site		•	
L12	Doyle Lake Area	•		
L13	Group 68	•		
L14	Group 4	•	•	
L15	Group 5	•	•	
L16	Group 6		•	
L17	Group 7		•	
L18	Group 8	•		
L19	Group 9	•		
L20	Group 20	•		
L21	Group 23	•		
L22	Group 25	•		
L23	Group 27	•		
L24	Group 29	•		
L25	Group 62	•		
L26	Group 63	•		
L27	Group 64	•		
L28	Group 65	•		
L29	Group 66	•		
L30	Group 66A	•		
L31	Extraction Pits	•		
L32	Group 60		•	
L33	PVC Area	•		
L34	Former Burning Area	•		
L35	Fill Area	•		
L100	PAS Survey Section L100	•		
L101	PAS Survey Section L101	•		
L102	PAS Survey Section L102	•		
L103	PAS Survey Section L103	•		
L104	PAS Survey Section L104	•		

TABLE 3-1
SURVEY SECTION FUTURE OWNERS
JOAAP, WILL COUNTY, ILLINOIS

Section	Section Description	Future Owner		
		USDA (Tallgrass Prairie)	State of Illinois (Industrial Parks)	Will County (Landfill)
L105	PAS Survey Section L105	•		
L106	PAS Survey Section L106	•		
L107	PAS Survey Section L107	•		
L108	PAS Survey Section L108	•		
L109	PAS Survey Section L109	•		
L110	PAS Survey Section L110	•		
L111	PAS Survey Section L111	•		
L112	PAS Survey Section L112	•		
L113	PAS Survey Section L113	•		
L114	PAS Survey Section L114			•
L115	PAS Survey Section L115		•	
L116	PAS Survey Section L116	•		
L117	PAS Survey Section L117	•		
L118	PAS Survey Section L118	•		
L119	PAS Survey Section L119	•		
L120	PAS Survey Section L120	•		
L121	PAS Survey Section L121	•		
L122	PAS Survey Section L122		•	
L999	Orphan LAP area Buildings			
M1	Southern Ash Pile	•		
M2	Explosive Burning Ground	•		
M3	Flashing Grounds	•		
M4	Lead Azide Area	•		
M5	Tetryl Production Area	•	•	
M6	TNT Ditch Complex		•	
M7	Red Water Area		•	
M8	Acid Manufacturing Area		•	
M9	Northern Ash Pile		•	
M10	Toluene Tank Farms		•	
M11	Landfill	•		
M12	Sellite Manufacturing Area	•		
M13	Gravel Pits		•	
M14	Former Pond Area	•		
M15	Sewage Treatment Plant	•		
M16	Motor Pool Area		•	
M17	Laundry Facility		•	
M18	Herbicide Storage Area		•	
M99	TNT Block Area (M6A)	•		
M100	PAS Survey Section M100	•		
M101	PAS Survey Section M101	•		

TABLE 3-1
SURVEY SECTION FUTURE OWNERS
JOAAP, WILL COUNTY, ILLINOIS

Section	Section Description	Future Owner		
		USDA (Tallgrass Prairie)	State of Illinois (Industrial Parks)	Will County (Landfill)
M102	PAS Survey Section M102	•		
M103	PAS Survey Section M103		•	
M104	PAS Survey Section M104		•	
M105	PAS Survey Section M105	•		
M106	PAS Survey Section M106	•		
M107	PAS Survey Section M107	•		
M108	PAS Survey Section M108	•		
M109	PAS Survey Section M109	•		
M110	PAS Survey Section M110	•		
M111	PAS Survey Section M111	•		
M112	PAS Survey Section M112	•		
M113	PAS Survey Section M113	•		
M114	PAS Survey Section M114	•		
M115	PAS Survey Section M115		•	
M116	North Pump Station		•	
M117	South Pump Station		•	
M999	Orphan MFG area Buildings			

Note: Sections L999 and M999 contain buildings at JOAAP for which the physical locations are not known other than what can be surmised from the numbering system. Section L6 will be divided between USDA and Will County. Sections L14, L15, and M5 will be divided between USDA and State of Illinois. Shadded sections are those covered by this report.

TABLE 3-2
DATABASES SEARCHED
JOAAP, WILL COUNTY, ILLINOIS

Database	Date of Government Version
STATE/LOCAL	
IEPA Leaking Underground Storage Tank Incident Reports	6/1/95
IEPA State Hazardous Waste Sites	6/1/95
IEPA Solid Waste Landfills Subject to State Surcharge	6/30/94
Illinois State Fire Marshal underground storage tank facility list	8/7/95
Northeastern Illinois Planning Commission - Solid Waste Landfill Inventory	8/1/88
FEDERAL	
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	6/30/95
Emergency Response Notification System (ERNS)	12/31/94
National Priority List	9/1/95
Resource Conservation and Recovery Information System (RCRIS)	5/31/95
Superfund Consent Decrees	varies
Corrective Action Reports (CORRACTS)	4/10/95
Facility Index System (FINDS)	7/27/94
Hazardous Materials Information Reporting System (HMIRS)	12/31/94
Materials Licensing Tracking System (nuclear materials)	8/1/95
National Priorities List Liens	10/15/91
PCB Activity Data Base System (PADS)	10/14/94
RCRA Administrative Action Tracking System (RAATS)	4/17/95
Superfund Records of Decision (ROD)	3/31/95
Toxic Chemical Release Inventory System (TRIS)	12/31/92
Toxic Substances and Control Act (Manufacturers and importers)	1/31/95
OTHER	
Former Manufactured Gas Sites	--
Federal Reporting Data System (public water supplies)	--
USGS Water Wells	--

TABLE 3-3
DATABASE RECORDS REGARDING NEARBY FACILITIES
JOAAP, WILL COUNTY, ILLINOIS

Site Name	Site Address	Zip code	Database(s)	Facility ID
Channahon				
NORTHERN ILLINOIS GAS CO	REXALL RT 66	60410	FINDS	
PITMAN MOORE INC	YOUNG RD	60410	RCRIS-SQG, FINDS	
Elwood				
ILDOT BRG NO 048 0053	TR 253 OVER I74	60421	FINDS, RCRIS-LQG	
ILDOT BRG NO 072 0032	IL 78 OVER I74	60421	FINDS. RCRIS-LQG	
ILDOT BRG NO 048 0035	CO HWY 18 OVER I74	60421	FINDS, RCRIS-LQG	
ILDOT BRG NO 048 0058 0055	174 OVER FRENCH CREEK	60421	FINDS, RCRIS-LQG	
UNIROYAL CHEMICAL CO INC	RT 53 & HOF RD	60421	FINDS	
TYLER JAMES & SONS ELEVATOR INC	RT 53 S 3MI	60421	FINDS	
ELWOOD STP	MISSISSIPPI ST PO BOX 435	60421	FINDS	
IL BELL TEL CO ELWOOD C D O	N SI MISS BETW PARK & MADISON	60421	FINDS, RCRIS-LQG	
Joliet				
PATTERSON RD I MILE WEST BRANDON RD			ERNS	
SOUTH MADISON AND BEACH STREET			ERNS	
JOLIET REFINERY I-55 AND ARSENAL ROAD			ERNS	
MOBIL OIL			ERNS	
MOBILE OIL CO I-55 ARSENAL RD			ERNS	
ILLINOIS RIVER MOBILE OIL DOCK			ERNS	
JOLIET REFINERY I-55 AND ARSENAL ROAD			ERNS	
JOLIET REFINERY I-55 AND ARSENAL ROAD			ERNS	
MOBIL DOCK			ERNS	
JOUET REFINERY I-55 AND ARSENAL ROAD			ERNS	
1415 LANGFIELD RD			ERNS	
JOLIET REFINERY I-55 AND ARSENAL ROAD			ERNS	
	I-55 & ARSENAL		HMIRS	
	I-55 & ARSENAL RD		HMIRS	
MOBIL JOLIET REFINING	I 55 & SMITH BRIDGE	60434	FINDS	
UNION CARBIDE CORP PLT 767	I 55 AND ARSENAL RD	60434	RCRIS-SQG, FINDS	

TABLE 3-3
DATABASE RECORDS REGARDING NEARBY FACILITIES
JOAAP, WILL COUNTY, ILLINOIS

Site Name	Site Address	Zip code	Database(s)	Facility ID
	300 W ALLEN ST		UST	2-016158
	1500 AMHERST CT		UST	2-013112
AT THE PLANT REFINERY	I-55 AND ARSENAL ROAD		ERNS	
	I-55 AND ARSENAL RD/ E. FRONT		HMIRS	
UNIROYAL, INC.	ATT: R. MILLER, PLANT MANAGER	60434	TSCA	
JACKSON CREEK METERING STATION	1 MI E OF IH 55 ON ARSENAL RD	60434	RCRIS-SQG	
	300 EARL ROAD		HMIRS	
ILLINOIS CANAL	OUTFALL AT PLANT		ERNS	
	UNKNOWN		UST	2-029413
Wilmington				
AMOCO FERTILIZER PLANT	RR 3	60481	RCRIS-SQG, FINDS	
SMITH OIL CO.	RT. 53 / WEST RIVER RD.	60481	LUST	901106
CAVANAUGH, FRANCIS	200 BALTIMORE ST.	60481	LUST	903271
CELOTEX CORP	CANAL & WATER STS	60481	FINDS	
MIDWESTERN GAS TRANSMISSION CO	FIRST ST IBLK FROM IL 53	60481	RCRIS-SQG, FINDS	
ILL BELL TEL CO WILMINGTON C D	N OF JACKSON E OF MAIN	60481	FINDS, RCRIS-LQG	
COMMUNITY OLDS PONTIAC	W RIVER RD S RTE 53	60481	RCRIS-SQG, FINDS	

TABLE 3-4
BUILDINGS SURVEYED
JOAAP, WILL COUNTY, ILLINOIS

Section Number	Building Number		Section Number	Building Number	
L12 and L13	None		L31	None	
L20	20-1	20-15	L35	None	
	20-4	20-17	L100	None	
	20-7	20-41	L101	63-9	63-53
L21	23-1	24-3	L102	None	
	23-5	23-30	L103	67-2	
	23-6	23-34	L104 Through L107	None	
	23-7	61-7	L108	71-9	
	23-7B	61-11	L109	None	
	23-29	61-39	L110	None	
	24-1	62-27	L111	None	
	24-1A	62-25A	L112	5-27	9-26
	24-2			9-19	74-3
L23	27-1	27-12	L113	None	
	27-4	27-13	L115	60-12	
	27-2	27-14	L116	None	
	27-3	27-15	L117	None	
	27-5	27-16	L118	64-35	65-35
	27-6	17-17		64-36	
	27-7	27-18	L119	None	
	27-8	27-19	L120	None	
	27-9	27-20	L121	64-36	
	27-10	27-21	M100	None	
	27-11	27-22	M101	None	
L25	62-1	62-11	M102	761-11	7
	62-3	62-12	M103	414	709-1
	62-5	62-13		704-13	15
	62-6	62-15	M105	411-2	1206
	62-8	62-18		706-11	
L26	63-7	63-56	M106	None	
	63-21	63-65	M107	None	
	63-26	63-67	M108	411-5	811-48
	63-39	63-75		704-14	811-49
	63-47			704-23	811-50
L27	64-5	64-32		707-13	811-51
	64-30	64-34		714-2	811-52
	64-31	64-33		718-2	811-53
L28	65-20	65-24		811-2	811-123
	65-21	65-25		811-46	811-124
	65-22	65-26		811-47	811-125
	65-23	65-29	M109	None	
L29	66-14	66-62	M110	None	
	66-52	66-63	M111	704-12	811-59
	66-58	66-64		811-5	811-70
	66-59	66-65	M111	811-6	811-114
L29	66-60	66-72		811-54	811-115
	66-61	66-73		811-55	811-116
L30	66A-123	66A-127		811-56	811-117
	66A-124	66A-128		811-57	811-118
	66A-125	66A-129		811-58	
	66A-126		M112	None	

4. ENVIRONMENTAL CONDITIONS

This chapter summarizes the findings of environmental conditions at JOAAP. Findings are based on the file search, interviews with personnel with knowledge of the JOAAP facility, and a site survey conducted in December, 1995 as part of the PAS.

Significant findings and an overview of relevant regulations are presented in the following subsections. All findings are presented by section or building number in the appendices and are summarized by finding type in the tables at the end of this section. Findings in the tables are designated as present, absent, suspected or removed. These designations are intended to provide a quick method of identifying potentially significant findings in the tables. Present is used to identify findings that do not fall into one of the other categories. Absent is used in relatively infrequent circumstances where there is definitive evidence that the condition is not present (i.e., a building which documentation indicates has never been contaminated with explosives). Suspected is used where it is believed that the environmental concern may be present but cannot be confirmed or refuted based upon existing information (i.e., a transformer that is not marked as to the presence or absence of PCBs). Removed is used where the environmental condition was present but has since been eliminated (i.e., a tank that has been confirmed as removed).

4.1 Hazardous Materials and Waste Management

This section discusses the environmental conditions associated with storage and disposal of hazardous materials. This includes identification, to the extent possible, of the type, quantity, and location of hazardous materials and treatment and storage areas associated with hazardous materials and wastes. A summary of chemicals used, stored, disposed, or released on the USDA parcel proposed for immediate transfer is presented in Appendix E. Issues specific to IR sites are addressed in Section 4.1.3.

Hazardous materials and waste management are governed by specific environmental regulations. For the purpose of the following discussion, the terms hazardous waste or hazardous materials are those substances defined as hazardous by CERCLA, 42 USC 9601-9675, as amended, and the Solid Waste Disposal Act, as amended by RCRA, 42 USC 6901-6992, as amended. In general this includes substances that, because of their quantity, concentration, or physical, chemical or infectious characteristics may present substantial danger to public health or welfare or the environment when released into the environment.

The LAP and the MFG areas have been separately included on the NPL. In addition, the operating contractor and several tenants of the facility were issued RCRA permits. A discussion of the regulatory history is presented in Section 2.2.3.

Although JOAAP has been placed in modified caretaker status, a variety of materials such as motor fuels, oils, industrial solvents, paints and acids are used by tenants (i.e., agricultural lessees, and Alliant Techsystems) on the facility. The 1994 *Spill Prevention Control and Countermeasures (SPCC) Plan and Installation Spill Contingency Plan* addresses the prevention of pollutant discharge and includes contingency plans to address unauthorized releases. The plan also identifies hazardous waste storage locations (ALSI01). Hazardous wastes generated on-site are disposed of off-site through the Defense Reutilization Marketing Office or contracts with hazardous waste disposal firms.

Historically, much of JOAAP was used for the manufacture, handling and shipping of primary and secondary explosives, propellants, munitions, and components. The plant provided infrastructure such as water, steam, power, sewage treatment, etc. for the manufacturing and LAP activities. The likely use, storage, or disposal of hazardous materials/wastes can be inferred from the Group or area names and the types of buildings present. Table 4-1 lists the Group or area name and description and provides the PAS study section number.

Storage magazines consist of two types; earthen covered reinforced concrete structures with an entrance at one end (igloos), and aboveground storage magazines constructed of clay block with corrugated asbestos cement roofing. Groups 63 (78 high explosive igloos, L26), 65 (33 smokeless powder igloos, L28), 66 (88 finished ammunition igloos, L29), 66A (41 finished ammunition igloos, L30), 68 (23 fuse, primer, and booster igloos, L13), and the 811 magazine area (132 igloos for storage of TNT, tetryl, DNT and lead azide, M108 and M111) are of the earthen cover design (ACOE06).

An Alliant Techsystems representative reported that Alliant does not use any acutely toxic materials and that all of their stocks of hazardous substances/materials are consumed, rotated or sent off-site so that nothing remains on-site for over a one year period (MEMO05).

L13/Group 68. Buildings 68-1, 2, 3, 14, 15, 18 and 23 are RCRA permitted hazardous waste storage areas (USEPA IL0210090049 issued to Alliant Techsystems, Inc.) (MEMO05, FIEL01). Three of these buildings (68-15, 18 and 23) are currently used by Alliant Techsystems Inc. to store raw explosives, propellants, scrap and residual tracer materials, component fuses, partial rounds, warheads and other components (FIEL01, MEMO05). All storage areas were inspected by IEPA on December 6, 1995 and no violations were documented. During the PAS site survey, a Hazardous Waste Storage sign was observed on the metal door on building 68-23 (FIEL01). RDX, and HMX sludges have been stored in magazine 68-14 in accordance with a RCRA permit. The drums were transported off-site and disposed of at a RCRA permitted facility in 1993 (DAMO22). Oil, hydraulic fluid, and anti-freeze for truck maintenance are stored in Building 68-18 (DOTA04). Tracer component materials are stored in Group 68 (MEMO05). Access to the inside of magazines in Group 68 was not possible during the December, 1995 survey as munitions are currently being stored in this area (FIEL01). Results of past sampling at Group 68 are presented in Appendixes B and D.

The sampling history at Group 68 consists of the collection of four soil samples at the location of a fire involving a drum containing RDX that occurred in July, 1990 near igloo 68-15. The samples indicated the presence of RDX and HMX in these soils. It is estimated that 13 cubic yards of soil were contaminated (DAMO01). The Risk Assessment evaluation for this site, indicates that none of the estimated risk or hazard values exceed the target criteria for the future human health exposure scenarios that were considered (DAMO23). The detected levels of explosives are less than the preliminary remediation goals (OHMC08).

L27/Group 64. Building 64-34 is used for PCB storage (FIEL01, ALSI01). The building was inspected during the PAS field survey and all materials appeared to be stored neatly (FIEL01) Building 64-5 was a hazardous waste storage area (CDKI01). Ammonium perchloride and magnesium-Teflon igniters were stored in this building (NPDES 1993).

L28/Group 65. Until October 1981, JATA used 65-4 and 65-5 for storage. An inspection of the igloos by the GOCO (Uniroyal) following removal of the JATA materials found the area in satisfactory condition (MILR01). Gasoline, oil, hydraulic fluid and antifreeze are stored in Building 65-34 (Section L28) (DOTA04).

L29/Group 66. Hazardous wastes were stored in a building at Group 66 as of 1993 (AOCE01). Drummed PCB contaminated liquids and solids were stored for longer than 30 days in Building 66-13 (ALSI01). The Treasury Department, Bureau of Alcohol, Tobacco, and Firearms was assigned igloos 66-74 through 66-77, 66-79 and 66-80 for storage of explosives. Storage began in 1970s. A 1982 inspection found that although the stored materials were not properly packaged or identified, the igloos were in very good condition and all material were stored on proper dunnage and separated or segregated within the individual igloos whenever possible (MILR02).

The State of Illinois granted clean closure under 35 IAC 725 to hazardous waste storage areas 66-86, 66-87, and to 66-88 (USEPA ILD7213820460, IEPA 1970450027). PBX pellets, boxes of scrap Composition B, drums of mixed sludge, used gas mask canisters, 12 ounces of 2,3,4,6-tetrachlorophenol and used battery acid were stored in these bunkers (JAAP16, EDII01). A report documenting the materials stored in these igloos was developed as a companion to the closure report.

Miscellaneous. Oil, hydraulic fluid and antifreeze for fork trucks are stored in Section L25, Building 62-13 (DOTA04). At L21 Building 23-29 was used to store chemicals to support the water treatment plant operations (FIEL01). At L23, building 27-22 was used by the FBI to store unknown types of materials (FIEL01). It was reported in 1993, that an operating contractor stored small quantities of tear gas (CS-CN) for training purposes at JOAAP (ACOE01).

4.2 Solid Waste

Solid waste disposal and management is regulated under the Illinois Solid and Special Waste Management Regulations. Closure and post-closure requirements for disposal units are specified in 35 IAC 811.110 and 811.111. Post closure requirements include groundwater monitoring.

In the event that any materials are removed from the solid waste disposal sites, it should be noted that soils, sediments, or other media contaminated with hazardous substances or PCBs are considered special wastes pursuant to 35 IAC 808 and 809. When transported on public highways, special wastes must be manifested and the truck must be a licensed special waste hauling vehicle.

All areas identified as having been used for disposal of solid waste on a regular basis have been studied as part of the IRP. In order to explain where the wastes generated at JOAAP were disposed, a brief description of all the identified JOAAP solid waste

disposal facilities is provided below. More detailed descriptions can be found in Appendix D. It appears that these disposal areas had sufficient capacity for all of the facility waste. Each of the areas discussed below lies either on, adjacent to or within a mile of the property indicated by USEPA as potentially appropriate for transfer at this time.

LAP AREA: Between 1960 and 1977, inert material and construction rubble were placed in a landfill located along the north side of Prairie Creek just east of Road 2 West (IRP Study site L4) (ARMY01, ACOE01). Once filling was completed at this site, a compacted soil cover was put in place (ARMY01). This area is not being considered for transfer to USDA at this time.

Within the parcel for transfer to USDA, one disposal site was used at the JOAAP and it is located at the LAP area. A state permitted sanitary landfill (Will County Permit 1982-034-OP 19780401) was located on the LAP area northeast of the intersection of Road 1/2 south and Road 1 West (L21). This landfill operated from 1982 to 1992 and as of early 1993, a closure plan was submitted for regulatory approval (ACOE01, DAMO06). Household trash, plant trash, construction debris and sludge from the STP (L20) were reportedly disposed in this two acre landfill (DAMO06). During the December 1995 survey, it was observed that the cap on this landfill was in good condition (FIEL01).

A debris area of approximately 1.5 acres is located east of Group 2 in L117. Previous studies have observed it to contain primarily scrap metal, wood, and concrete (DAMO11). This debris is believed to be the remains of Building 2-10 which was destroyed in an explosion in 1942 (DAMO11, WDEP01). The debris in this area was not considered to be of environmental concern and MW504 which is located adjacent to the area has not shown any contaminants of concern (DAMO11). The December 1995 site reconnaissance observed old 5-gallon containers, railroad ties, metal and wood scrap, and transite in the debris area (FIEL01).

A small pit was used to dispose of various wastes at L23a (Group 27). It is not known what type of wastes were disposed at this location however, this area continues to be investigated as part of the IRP (DAMO25). Additional sampling was conducted in 1995, results of that effort will be reported in the FS.

A small debris area was observed in the south end of M106 during the field survey. The area contained a variety of items such as appliances, bricks, and scrap metal (FIEL01).

MFG AREA: Red water ash was buried at the Burning Ground (M2) (ACOE01). Between 1950 and 1953, asbestos, insulation, and construction rubble were placed in a low area located east of the MFG area Burning Ground, west of the 811 Magazine Area, and north of Prairie Creek Schoolhouse Road and covered with soil (M11)(ACOE01, ARMY01). A third MFG area disposal site (M13) was located just west of Acid Area 1 in an abandoned gravel pit (ACOE01, ARMY01). Neither M2, M11, nor M13 is within the agricultural parcel.

The north and south ash piles (M9 and M1) were capped by covering with a plastic barrier, approximately 12 inches of clay and 6 inches of top soil and seeded with grass (ACOE01, ARMY01). The north pile is on the parcel to be transferred to the State of Illinois. The south pile was used from 1967 to 1976 (ARMY01). The south ash pile is located south of the west end of the 811 Magazine Area. Red water ash was also buried in the north portion of IRP Study M2 in a manner similar to that of the north and south ash piles (ARMY01). Neither M1, nor M9 is within the agricultural parcel.

Burning Grounds: Four areas (L2, L3, M2, and M3) were identified as burning grounds for explosive wastes. An area (L3) south of Group 23 was used during the late 1950s and early 1960s. Some demolition operations were also conducted in this area. Two other areas used since 1941 contain explosive waste residue (ACOE01). Each of these sites is

within an IR study area and none of the sites are being considered for transfer to USDA at this time.

A fifth area (L34) is located in the central portion of the LAP area. This burning area is shown on maps dating back to 1944. The 1944 maps show two burning areas and access to the burning area via a railroad spur (WDEP04). The RI identified three separate burning areas within the site. No information is available concerning the types of materials burned at the site (DAMO06). A field visit conducted during September 1996 found numerous piles of crushed ceramic items and glass slag in one of the burning areas. This material is eroding from the stream bank into Prairie Creek. The ceramic items were subsequently identified as the bodies of nonmetallic mines and were determined through a wipe test to have explosive residues present. A former Uniroyal employee indicated that demilitarization of mines included the crushing of the housings and they may have been disposed of in this area (FIEL01).

Treated Wood Products: Treated wood products were used in a number of applications at JOAAP including building construction, construction of earthen barricades, railroad ties and utility poles. These items had been treated to resist decomposition by rot, decay, fungus, and insects. Typical wood treatment compounds include creosote and associated derivatives, pentachlorophenol and chromated copper arsenate. Aged treated wood products no longer in use are subject to waste classification procedures in Illinois Administrative Code at 35.722.111 and 721.104(b)(9). The primary consideration for classification is whether the materials demonstrate characteristic hazardous waste properties especially if prohibited levels of arsenic, chromium, cresols, benzene or pentachlorophenol are present. This would be determined through TCLP analysis.

The Illinois Environmental Protection Agency (IEPA) has determined, in accordance with USEPA guidance, that weathered treated wood products may be disposed of as solid waste. The agency has defined weathered to mean; "treated wood that is old, it has been in obvious use, exposed to the elements for some time, has no surface globules and is not

sticky to the touch, the surface is dry and the dark staining that occurs when wood is freshly treated with these compounds is not present." The agency has indicated that weathered treated wood products will not exhibit a hazardous characteristic, so this visual determination and knowledge of historical use could be used in lieu of TCLP testing. In this case, the material may be handled and disposed of as a non-special solid waste.

The bulk of the treated wood at JOAAP consists of railroad ties along the greater than 150 miles of tracks at the plant. The tracks have not been serviced in over ten years and thus all ties would have been exposed to the weather for at least that duration. The other treated wood was used in construction or utility poles, and in blast protection barricades that are also generally over ten years old. It is therefore believed that these items are appropriately classified as non-special solid wastes.

IEPA indicates that treated wood products considered a non-special solid waste can be abandoned in place (MEMO06). Therefore, railroad ties, barricades, treated wood buildings, and utility poles may be left in place.

4.3 IRP Sites

JOAAP has fifty-three separate IRP sites as shown in Figure 4-1. General descriptions and environmental conditions at IRP site areas are presented in Appendix D. RIs have been performed at all of the sites and where appropriate, a risk assessment has also been conducted. The risk assessment calculated risk based upon a reasonable maximum exposure (RME). The RME is defined as the highest exposure that could reasonably be expected to occur and is intended to account for uncertainty in contaminant concentrations and variability in exposure parameters. The RME is a conseravtive exposure case (i.e., well above average) that is still within the range of possible exposures. A summary of the results of the risk assessment is presented in Table 4-2.

USEPA has generally defined carcinogenic risk values greater than 1×10^{-4} as unacceptable, and risks below 1×10^{-6} as being acceptable for most hazardous waste facilities under CERCLA. Residual carcinogenic risks on the order of 1×10^{-6} are used as the "point of departure," or target level for site remediation but may be modified by regulatory requirements or site specific considerations. The potential for non-carcinogenic effects from long-term chemical exposure is evaluated by the Hazard Index. A Hazard Index above one indicates that non-carcinogenic health effects may be possible. Contaminants of concern were not identified at L21 and L22, L24 through L31, and L35 and therefore, no risks were calculated (DAMO23).

Work has been initiated on FSs for those areas where a risk was identified. Interim remedial actions (capping) have been conducted at the Red Water Lagoon, and Northern and Southern Ash Piles in the MFG area. Specific information related to the sites including analytical data can be found in the RI reports (DAMO05, DAMO11).

There are 35 IRP sites located in the LAP area of which 16 (L12, L13, L20 through L31, L34, and L35) are considered for transfer in this report. These sites were identified by USEPA as potentially ready for transfer (RBOW01). The Phase I RI found no evidence of environmental contamination at nine of the IRP sites (L20, L22, L24, L26, L27, L29 through L31, and L35) and these sites were recommended for removal from the RI process. No additional studies have been conducted at these sites under the IRP (DAMO06). Two additional sites (L25 and L28) were recommended for removal from the RI process in the Phase 2 RI (DAMO13). All 11 sites recommended for removal from the RI process, are located in the Agriculture parcel.

The 1994 ecological risk assessment was conducted to determine if deleterious effects resulting from chemical contamination are present in flora and fauna at JOAAP. This was accomplished through the examination of existing environmental data, collection of additional samples where necessary, literature review, toxicity testing, and field surveys. Three study areas on the MFG area (M2, M4, M6) and three on the LAP area (L1, L2,

L7) were selected for field investigation. Study areas were selected based upon presence of contaminants, and habitat viability (industrial areas were not evaluated). In addition, an ecological risk evaluation was performed for each of the creeks at JOAAP (AEHA10).

Soil testing identified areas of M2 (MFG Burning Ground), L2 (LAP Burning Ground) and L7 (Group 1) as the sites with the highest levels of soil toxicity. Rodents on these sites are not accumulating metals above natural levels and no abnormal histopathological effects were seen in mice sampled. Potential plant community shifts were found at Group 61 (L1) and at the MFG Burning Grounds (M2). Adverse impacts to threatened and endangered species at JOAAP via terrestrial chemical exposure routes are expected to be minimal (AEHA10).

Potential ecological exposure pathways to humans include the consumption of contaminated crops, game, and fish. Crops are not grown on any contaminated sites and therefore a complete pathway does not exist. Deer meat was collected (as an indicator of game species) and a separate report by AEHA concluded that consumption does not pose a health risk under current hunting conditions. Fish tissue analysis did not reveal the presence of explosives or PCBs. Although low levels of barium, zinc, iron, and DDE were detected, no human health risk is expected from ingestion of fish (AEHA10).

The aquatic evaluation determined that stream health and quality (based on benthic macroinvertebrate analysis) is improved as Jackson, Prairie, and Grant Creeks exit JOAAP. The health of Jordan Creek is unaffected by JOAAP. Spoil Bank Creek quality was moderately low immediately downstream of JOAAP, and moderate about one mile off-post (AEHA10).

In summary, the Army ecological risk assessment program determined that any adverse contamination-related toxic/health effects which are occurring or might occur in the future are not expected to significantly reduce the structure and function of any of the important aquatic and terrestrial components of the JOAAP ecological landscape.

Specifically, fish and crayfish are not accumulating explosives and potential food-chain exposures are not occurring. For the terrestrial components, it was determined that neither rodents nor deer meat are accumulating metals above natural levels or explosives. Limited areas (considered *de minimus)* of impact to plants, earthworms, and micro-organisms have resulted from residual soil contamination (AEHA10, CHPM01, CHPM02, OHMC08).

A total of 18 IRP study areas lie in the MFG area. Only M15 however was considered potentially appropriate for transfer at this time and the other sites are not addressed (RBOW01). However, the TNT Blocking Area discussed below encompasses the M15.

During conduct of the PAS, the former TNT Blocking Area (M99) was identified. It was subsequently decided to include this area within the TNT Ditch Complex IR study site M6. Due to the similarity of compounds expected to be present in this area, it has been designated area M6A.

For the MFG area, 13 IR study areas potentially requiring remediation were grouped into three operable units (OUs) the soils, groundwater, and landfill OUs. The OUs are further broken-down into remedial units (RUs) based upon contaminant types. The OUs and RUs are as follows (OHMC09):

Groundwater OU

- MFG/GRU-1 Explosives and volatile organic compounds in groundwater - IR sites M3, M5, M6, M7, M8, and M13.
- MFG/GRU-2 Volatile organic compounds in groundwater - IR sites M6, M8, and M10.

Soils OU

- MFG/SRU-1 Explosives in soil - IR sites M2, M5, M6, and M7.
- MFG/SRU-2 Metals in soils - IR site M4.
- MFG/SRU-3 Explosives and metals in soils - IR sites M3 and M12.

Landfill OU

- MFG/LRU-1 Mixed contaminants - IR sites M11 and M13.

For the LAP area, the IR study areas potentially requiring remediation were grouped into two OUs one for contaminated groundwater and the other for soil. The OUs are further broken down into ten RUs based on the OU and chemicals of concern. The RUs are as follows (DAMO28):

- RU 1 includes areas with explosives in soil and/or sediment.
- RU 2 includes areas with metals in soil and/or sediment.
- RU 3 includes areas with metals and explosives in soil and/or sediment.
- RU 4 includes areas with PCBs in soil and/or sediment.
- RU 5 includes areas with metals and organic compounds in soil and/or sediment.
- RU 6 includes areas with other contaminants in soil and/or sediment.
- RU 7 includes other types of sites.
- RU 8 includes areas with explosives in groundwater.
- RU 9 includes areas with explosives and metals in groundwater.
- RU 10 includes areas with other contaminants in groundwater.

During the Phase 2 RI six parcels of land outside of the secured perimeter of the MFG Area were studied. These parcels border the MFG area to the south and west. Four of these parcels 1, 2, 3 and 6 are areas included in the agricultural transfer. Except for slightly elevated lead (18 μg/L) concentrations in one monitoring well in Parcel 3, no environmental concerns were noted in these four parcels. The other two parcels are no

longer part of the JOAAP property (DAMO12). The four parcels (1, 2, 3 and 6) fall within six PAS study sections: M105, M106, M107, M112, M113 and M114.

4.4 Asbestos

Asbestos Containing Material (ACM) remediation is regulated by USEPA, the Occupational Safety and Health Administration (OSHA), and the State of Illinois. Asbestos fiber emissions into the ambient air are regulated in accordance with Section 112 of the Clean Air Act, which established the National Emissions Standards for Hazardous Air Pollutants (NESHAP). NESHAP regulations address the demolition or renovation of buildings with ACM. The Toxic Substances Control Act (TSCA) and the Asbestos Hazard Emergency Response Act (AHERA) provide the regulatory base for handling ACM in kindergarten through 12th grade school buildings. AHERA and OSHA regulations cover worker protection for employees who work around ACM.

Asbestos fibers are released by disturbance or damage to various building materials such as pipe and boiler insulation, acoustic ceilings, sprayed on fire proofing and other material used for sound proofing insulation.

Two primary categories describe ACMs. Friable ACM is defined as any material containing more than one percent asbestos that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure (Appendix A, Subpart F, 40 CFR Part 763, Section 1, polarized light microscopy). Non-friable ACM are those materials that contain more than 1 percent asbestos, but do not meet the rest of the criteria for friable ACM. Asbestos is considered a special waste if it is friable. However, if it is wetted and managed in accordance with NESHAP, it is a solid waste.

A base-wide survey for ACM is required by the Federal Property Management Regulations (FPMR) disclosure law prior to base disposal. Professional Service Industries, Inc. completed a survey of all existing JOAAP facilities for asbestos in 1993.

This survey report is based on the inspection of building construction including pipes, walls and flooring. The asbestos survey identified 246,112 linear feet of asbestos insulation material on pipe of various dimensions, ranging from one inch to 18 inches in diameter and 88,477 square feet of asbestos insulation material on various equipment items in approximately 815 buildings (ROCK01). Detailed information obtained in the survey, including locations within buildings and type of asbestos found, is maintained by JOAAP personnel in building 74-3.

Renovation or demolition of structures with ACM has a potential for releasing asbestos fibers into the air. ACM is present at JOAAP associated with pipe or boiler insulation, acoustical ceilings, transite building materials, sprayed on fire proofing and other material used for sound proofing or insulation. Asbestos was widely used in building construction activities prior to 1978. Virtually all buildings at JOAAP were constructed between the early 1940's and 1978.

As discussed in Section 2.2.1.12, two types of asbestos putty were manufactured in Building 739-1 located in M105 (MEMO13, USOP23). The putty was used as a sealant primarily in places such as recovery towers, packing glands, etc. (UCCI31). The putty contained up to about 50 percent asbestos. The putty also contained high percentages of barium sulfate and lead (USOP23).

4.5 Storage Tanks

USTs are subject to federal regulations within RCRA, 40 CFR Part 289, Technical Standards and Corrective Action Requirement for Owners and Operator of USTs. These regulations were mandated by the Hazardous and Solid Waste Amendments of 1984. The state of Illinois leaking UST program and the Federal corrective action requirement is implemented by USEPA. Illinois state law and IEPA regulations are still in effect.

Storage tanks were used at JOAAP to store various raw materials, process intermediates, products, fuels and wastes. The USTs and above ground storage tanks (ASTs) at JOAAP are constructed of steel, concrete, stainless steel and other materials.

In 1989, the U.S. Army Corps of Engineers (USACOE) completed an *Investigation and Evaluation of Underground Storage Tanks* at JOAAP. The study investigated all known existing UST's, as defined in 40 CFR 280, and all heating oil tanks. Seventy tanks were identified through interviews of site personnel (ACOE02). Thirty-seven additional tanks have been identified since the USACOE investigation (AEST01).

A list of former and current USTs for the entire JOAAP property has been compiled through records review and site survey observations (Table 4-3). Although locations and other information cannot be identified or obtained related to all the tanks, 27 of the tanks are known to have existed on the agricultural parcel. Documentation of tank removals is incomplete and no records for removal of USACOE tank numbers 41 and 105 were available at the time of this report. Table 4-3 includes a numerical designation (assigned by the USACOE) and building number designating the tank location. The table also includes the tank size, location designation, construction and removal date, if available. The tanks located in the Agriculture parcel are shaded in the Table 4-3.

In December 1990, Brandenburg Industrial Service of Chicago, Illinois, removed and disposed of five USTs (BRAN01). Best Environmental Incorporated, from Channahon, Illinois, removed 43 USTs in 1991 and an additional nine in December, 1993 (BEST01, BEST03). In 1994, ATEC Associates, Inc. from Indianapolis, Indiana, removed 25 USTs from JOAAP (ATEC01 through 14). Documents exist identifying tank removal but they do not indicate a date or a removal/disposal vendor. In most cases, soils that were impacted by various spills or leaks associated with the tanks were removed and properly disposed. Samples were collected from the excavations to ensure that the remaining soils were below the appropriate criteria for tank excavation clean-ups. In most cases, the excavations were refilled using soils from an on-site borrow pit. Specific information

concerning tank condition at the time of removal and remedial actions taken is contained within the tank removal reports.

A suspected UST fill pipe and vent is adjacent to Building 24-1 (L116). A petroleum odor was noted at the suspected fill pipe and a photoionization detector reading of 40 ppm at the top of the pipe indicated the likely presence of volatile organic compounds (FIEL01). None of the previous UST studies identified a UST at this location.

Pipes possibly indicating the presence of USTs were observed at Buildings 20-15 (L20) and 61-11 (L21) and within a foundation in L112 (FIEL01). Historic documentation indicates that a gas station, pump, and a 1,000 gallon tank were located on the south side of building 814 south of Barrel House Road (M105) and a second set of gas pumps was located at the intersection of West TNT and Tetryl Roads (location not clearly shown on map, either section M108, M4, or M5) (KOWS01). It is unknown if USTs were associated with either of these pumps and if those USTs were removed.

Due to the age of the USTs, it is assumed that they do not comply with current regulations. The location, size and contents of these USTs should be confirmed.

No USTs are present in areas currently operated by Alliant Techsystems (MEMO05).

Fifteen ASTs in various states of repair/disrepair are present on the USDA parcel. Details concerning the layaway procedures for ASTs are not known. It is possible that some of the tanks may not be empty or that some residual materials remain which may pose a hazard to human health or the environment.

No comprehensive list of JOAAP ASTs is available from existing documentation. A large number of ASTs previously used for process materials, fuel oil, gasoline, and wastes are present at the facility. Table 4-4 provides a listing of AST findings.

None of the ASTs observed during the December 1995 survey had apparent leakage. However, it was not possible to see beneath some of the larger tanks. If ASTs are removed as part of the site liquidation, the soil beneath the tanks should be inspected for evidence of tank leakage.

Most of the storage tanks at JOAAP were emptied and laid away as of 1993. ASTs with any contents were visually inspected monthly by the Army. UST removal was conducted on an "as-funded" basis. Drains in dikes are kept closed and any time that the dikes required drainage, the procedure is closely monitored to assure that no product was released (ACOE01).

4.6 Sumps, Dry Wells, Oil/Water Separators, and Septic Systems

Sumps are present in several of the operational areas including Groups 2, 3, 3A, and 4, TNT melt areas and the oleum plant. Dry wells are used for disposal of waste liquids and rain water. A dry well was located in the Lead Azide Area. A French drain was present in the tetryl areas. Oil/water separators are generally associated with shop areas and gasoline stations. Septic systems associated with latrines were found in many of the explosive storage areas. Some isolated buildings at the facility were also on septic systems as it was not economically feasible to provide sanitary sewer service. Additionally, it is likely that many of the existing farmsteads converted for military use were served by septic systems in the early years of the plant even if later connected to the sanitary sewer system. Septic systems are regulated by the Will County Health Department.

Alliant Techsystems has no knowledge of any septic systems or oil water separators in areas in which they operate (MEMO05).

Sumps in the LAP production groups were periodically cleaned out and residue was disposed of at the burning grounds. During peak production years, sumps occasionally overflowed and discharged directly into open drainages (ACOE01).

A 1959 Master Plan for JOAAP indicates that there were 55 septic tank serving isolated buildings on the MFG area but locations were not given (ACOE06). A number of septic tanks were identified as part of the PAS associated with latrines or isolated buildings. Findings for sumps, dry wells, oil/water separators, and septic tanks on the USDA parcel are presented in Table 4-5.

A septic system or oil/water separator may be present at building 718-2 (M108). This was a locomotive service building and was later used to store potentially contaminated dinky cars. A sample taken in the bottom of the locomotive service "grease monkey pit" contained PCBs between 1.1 and 4 ppm (FIEL01).

No information was found to indicate that any septic systems were used for disposal of industrial wastes.

None of the USTs removed in the agriculture parcel (Table 4-3) were reported to contain waste oil and likely did not have oil/water separators.

4.7 Radon Gas

Radon gas is a colorless, odorless naturally occurring radioactive gas that is generated from the radioactive decay in the uranium/radium pathway. Radon gas emanating from soils, soil gas and groundwater can enter through cracks and other openings in building structures and become a component of breathable air within buildings. Exposure to radon is associated with an increased risk of lung cancer. USEPA suggests that remedial action be considered if the average annual radon level in the living area of a residence exceeds 4 pCi/l.

In spring of 1989, radon testing was conducted by the Army on 44 separate buildings at JOAAP. The radon canisters were left in place over approximately a one year period. Fifteen of these samples were collected at building units in the agriculture parcel. Thirteen samples were collected at the former Brown Circle Housing area in M102. Samples from four of these buildings show radon concentrations above the USEPA level of 4.0 pCi/l. These concentrations were found in 1101-1, 1101-7, 1101-8 and 1101-15 at 4.2, 5.4, 4.2, and 4.1 pCi/l, respectively. The former residences were apparently closed and unoccupied during the testing period (RADO01, RADO02).

During the site survey conducted in December, 1995, radon canisters were deployed in 28 separate buildings in the agriculture parcel and were left in place for approximately a week. The samples, four duplicates, a field blank, and a trip blank were submitted to Radon Services, Inc. of Pittsburgh, Pennsylvania for radon analysis. Twelve samples exceeded the USEPA levels for radon in buildings. Of these 12 buildings, only four were non-igloo type buildings and were located in L23 (Group 27, 27-1 and 27-2) and L25 (Group 62, 62-3 and 62-6). The other buildings were located in Groups 66 (L29), 66A (L30), 63 (L26) and the explosive storage area (M108) in the MFG area. These buildings are all igloo-type structures and are more likely to trap radon due to the concrete/earthen relatively air-tight construction. These igloos are not designed for continuous occupancy. The concentrations in the 12 samples referenced ranged from 4.9 to 24.8 pCi/l. The quality assurance sampling results support the validity of the test findings (FIEL01). Table 4-6 provides the radon sample results for the USDA parcel.

4.8 PCBs

PCBs are a general class of chemicals produced by chlorination of biphenyls. PCBs persist in the environment, accumulate in organisms and concentrate in the food chain. PCBs are used in electrical equipment, primarily in capacitors and transformers, because they are electrically non-conductive and stable at high temperatures. At JOAAP, oil

filled electrical switches were used to eliminate electrical sparks in areas where there was a potential explosion hazard.

Disposal of these compounds is regulated under TSCA, which banned the manufacture and distribution of PCBs with the exception of PCBs used in enclosed systems. By definition "PCB equipment" contains 500 ppm PCBs or greater. "PCB-contaminated equipment" contains PCB concentrations of 50 ppm or greater, but less than 500 ppm (40 CFR 761.3).

TSCA (40 CFR 761.40) requires that all PCB transformers (transformers containing over 500 ppm PCBs) be clearly marked. By implication, a determination as to the PCB status of transformers is required. PCB transformers that are "in use" in a facility that is not totally enclosed must be inspected quarterly (40 CFR 761.30). PCB and PCB-contaminated equipment that is out of service awaiting disposal can be stored for up to one year in a properly constructed PCB storage for disposal area (40 CFR 761.65). USEPA, under TSCA, regulates the removal and disposal of all sources of PCBs containing 50 ppm or more; the regulations are more stringent for PCB equipment than for PCB-contaminated equipment. The disposal of transformers containing oil with PCBs over 50 ppm is regulated under TSCA (40 CFR 761.60).

USEPA has established criteria for PCB spill cleanups under TSCA (40 CFR 761.120). Cleanup levels established for soils of 10 mg/kg PCBs for non-restricted access areas (provided the soil is covered with at least 10 inches of soil containing less than 1 mg/kg PCBs) and 25 mg/kg PCBs for areas where access is restricted. The non-restricted access cleanup level of 10 mg/kg was recommended for JOAAP in the *Preliminary Remediation Goals, Final Report* for the site. The report indicated that a preliminary remediation goal of 1 mg/kg was selected for all surface soils (upper 10 inches of soil) (OHMC08).

A 1986 document indicates that all transformers at facilities used by Honeywell, Inc. were tested for PCBs. The survey determined that no askeral containing transformers remained in the Honeywell area (DOTA03).

In 1993, an extensive PCB survey was conducted at the JOAAP by United Power. The survey included identifying, sampling and analyzing equipment potentially containing PCB contaminated fluids. Transformers, breaker boxes and other various machinery were included in the United Power survey. Some of the sampled units indicated PCB contamination (UCCI02). JOAAP personnel report that this PCB survey was on an "as funded" basis and may not be complete.

Due to the age of the rotating power generating equipment in the North and South Powerhouses, North and South Power Substations, Acid 4 Substation, and the LAP North and South Substations, PCBs may be present in transformer cooling fluid and dielectric oils, high voltage circuit breakers and capacitors (AEST01). The 1959 Master Plan indicates that the Elwood North Substation was formerly the principal source of power but had been placed in standby and the transformers had been removed (ACOE06). No record of soil sampling has been found for the powerhouses or any of the substations except LAP south.

The LAP area south substation (located in L6) is currently operated by Alliant which also formerly operated the North MFG substation. Alliant reports that no PCB transformers remain in the areas which they actively operate (MEMO05). No information concerning the sampling to confirm the presence or absence of PCBs in soils at the LAP north substation was found.

During November 1995, USEPA conducted a survey of oil filled electrical switches. It was estimated that 900 switches are present located mainly in the TNT (M6), DNT (M6), and tetryl (M5) production areas. A number of leaking switches were also noted on three conveyor equipped igloos in the 811 area (M111). No switches were found in the acid

area or LAP area, and only two were found in the red water incineration area. It is not known if or how often the fluid was changed nor is the disposition of those fluids known. The USEPA survey did not include sampling of the switches to determine if PCBs are present (EPAV14). Oil-filled electrical switches are also present at the toluene tank farms (M10).

During the December 1995 PAS site survey, eight samples (soil and oil) were collected and analyzed for PCB concentrations using field screening methods. The oil samples were analyzed using Dexsil (Chlor-N-Oil) field screening kits while soil samples were analyzed using the EM Science (D-TECH) field screening kits (immunoassay). Two soil samples showed positive results for the presence of PCBs. These were located in M108 and associated with an electrical box on pole 0517 which is located near 811-125 (between 4.1 and 15 ppm) and in a drain at Building 718-2 (between 1.1 and 4 ppm) (FIEL01). No oil sample results showed the presence of PCBs above 50 ppm. Field screening results are presented in Table 4-7.

During the December 1995 site survey, the locations of pole and ground transformers were identified. The locations and related information can be found on Table 4-8. The presence or absence of PCBs in these transformers was not determined as part of this PAS.

A summary of sampling and analysis information for PCBs related to IRP sites in the Agriculture parcel considered for immediate transfer is provided in Table 4-9.

Two locations associated with this transfer parcel were used to store PCB materials and are located in igloos 64-34 and 66-13 which are within L27 and L29, respectively (DAMO06). Building 64-34 is used for PCB storage (FIEL01, ALSI01). The building was inspected during the PAS field survey and all materials appeared to be stored neatly (FIEL01). Drummed PCB contaminated liquids and solids were stored for longer than 30 days in Building 66-13 (ALSI01).

4.9 Pesticide/Herbicide Use and Storage

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulates the registration and use of pesticides. Pesticide management activities are subject to federal regulations contained in 40 CFR 162, 165, 166, 170, and 171. As of October 1972, the Federal Environmental Pesticide Control Act was enacted which regulated the manufacture and sales of pesticides.

Soils contaminated by the storage, mixing, or handling (but not application) of pesticides/herbicides would be a special waste and may be a RCRA hazardous waste due to the characteristic of toxicity.

Stored pesticides were not found at JOAAP during the December, 1995 survey of the Agricultural parcel. No significant storage areas or usage of pesticides was documented during the file search for the transfer to USDA. Although, some pesticide contamination has been shown in the Agricultural parcel during the RI, it is likely that these contaminants are due to normal application of pesticides by agricultural leases on-site.

JOAAP is located in a high yielding agricultural area. Prior to 1973, only non-surplus crops were grown which included popcorn and hay. Corn, wheat, and soy beans were grown between 1973 and 1978 (ARMY01). In 1995, there were 103 tracts totaling 17,066.5 acres in the agriculture outlease program. Prior to the 1990s, no records of pesticide use by lessees were maintained. Lessees have always been required to comply with applicable regulations concerning pesticides. Since at least 1980, lessees have been required to dispose of excess pesticides and empty containers off-site in compliance with applicable regulations. Lessees typically perform sprayer maintenance and calibration off-site (MEMO04).

Alliant Techsystems is currently operating portions of the LAP area under contract. Pesticide use by Alliant is very limited and is restricted to pesticides specified in that contract (MEMO05).

Fertilizer usage at the JOAAP in 1978 consisted of nitrogen, potassium and phosphates. Recommendations for fertilizer usage was directed by the Land Management Office based on soil tests and crop needs (ARMY01).

Spraying of herbicides (Nalco H-174K) was conducted annually along railroad tracks in 1966. The herbicide contains eight percent 3-(3,4-dichlorophenyl)-1-1-dimethylurea, 87 percent sodium tetraborate, and five percent inerts (UCCI15).

Prior to 1972, dieldrin, aldrin, DDT, and other chlorinated hydrocarbons were used on the crops. Malathion was used for mosquito control while Nalco and atrotol herbicides were used along railroad right of ways. Brulin was used in 1962 as a soil sterilant along the installation fences. Spraying of this herbicide resulted in arsenic poisoning and the death of 21 cattle over a fourteen month period. Two agricultural tracts in the LAP area, tract 2 near Doyle Lake and tract 23 on the west boundary, were contaminated. Doyle Lake drains into Jordan Creek and the western boundary of the LAP area drains into Prairie Creek (ARMY01).

Pesticides are known to have been mixed, stored, or dispersed at four locations on-site (L6, M16, M18, and M103). These study areas are not within the USDA parcel. The information is being provided as it is relevant to what may have been used on the LAP area and the MFG area during specific periods.

Mixing and dispersing of pesticides is known to have been conducted from building 70-46 (L6) between 1957 and 1963. It is unknown if pesticide handling started prior to 1957 or if it continued after 1963. At least some of the work was done outdoors. DDT, chlordane, warfarin, malathion and lindane were used (DOTA16, DOTA17, DOTA18).

An undated standard operating procedure indicates that pesticides and insecticides were kept in a storage area in TS-1230 (M103) or "other designated area." The material was poured into tanks outside the building. Following use, the machine was to be returned to the wash rack (location unspecified). Operating equipment that was in contact with herbicides was flushed with water and equipment in contact with insecticides was flushed with ammonia (USOP52).

By 1978, only herbicides were used at JOAAP (ARMY01). Mixing was conducted to the rear of building 704-19 which is located within an IRP Study area (M16) (FIEL01, MEMO04, ARMY01). Herbicides were used only along railroad right of ways and dispersed with a 5-ton lowboy sprayer in 1978. A certified pesticide agent license was issued to the Road and Grounds supervisor in 1973 who, as of 1978, was still overseeing the post pesticide programs. The herbicides in use a JOAAP in 1978 were (ARMY01):

- Atrex (atrazine)
- Ramrod (propachlor)
- Sutan (butylate)
- Treflan (trifluralin)
- Lasso (alachlor)
- Slo Gro (maleic hydrazide)
- 2,4D-amine
- 2,4,5-T

When non-standard herbicides were required, annual written approval was obtained from ARMCOM-AMSAR-ISF-R. Empty herbicide containers were disposed in the sanitary landfill as of 1978 (M13) (ARMY01).

Herbicides were stored in a Quonset hut on high ground near the MFG area administration building from 1990 to 1993 (M18)(DAMO12, ARMY01). No evidence of spills was found in or around the building (DAMO12). The building was reported to be clean and dry with a concrete floor (ACOE01). In 1993, the remaining herbicides were

either consumed or those that were not consumed were to off-site facilities for their use (MEMO09).

Family housing, administrative lawns and athletic fields were fertilized twice yearly with a 1-1-1 ration plant food at a rate of 15 pounds/100 square feet. Fertilizer application rates for crops grown at JOAAP can be found in ARMY01.

4.10 Lead Based Paint

Lead was originally added to paint to increase durability and increase paint's ability to withstand the elements (DOTA05). Lead can cause permanent damage to the brain and many other organs and causes reduced intelligence and behavioral problems. Lead can also cause abnormal fetal development in pregnant women. The Consumer Product Safety Commission banned the use of lead-based paint in residential applications in 1978.

To protect the public from exposure to lead from paint, dust, and soil, Congress passed the Residential Lead Based Paint Hazard Reduction Act of 1992 also known as Title X. Section 1018 of the law directed the Department of Housing and Urban Development and USEPA to require disclosure of known information on lead-based paint an lead-based paint hazards before the sale or lease of most housing built before 1978.

The Act requires that buyers of residential property (excepting efficiencies, elderly housing, housing for the handicapped, and short term leases) be informed that buildings built prior to 1978 may contain lead based paint. Specific notice requirements are spelled out in the act. Testing is not required nor is there a notification requirement for non-residential properties. The only buildings currently identified for use as residences are in the Brown Circle area (M102).

Lead-based paint and contaminated soils or debris containing lead-based paint from nonresidential structures are a special waste and may be a may be a RCRA hazardous

waste due to the characteristic of toxicity. The Illinois Bureau of Air has requirements governing the removal of lead-based paint.

Most facilities/buildings constructed prior to the Department of Defense ban on the use of lead-based paint in 1978 are likely to contain one or more coats of such paint. In addition, some facilities constructed immediately following the ban may also contain lead-based paint, because inventories of lead-based paints that were in the supply network were likely to have been used up on these facilities.

Virtually all structures (buildings, tanks, etc.) at JOAAP were constructed prior to 1978 (JAAP10). All painted surfaces on structures built prior to 1979 should be assumed to be painted with lead-based paint unless analytical testing indicates otherwise.

Exterior surfaces which were painted with lead-based paint may have caused some localized soil contamination due to deterioration of the paint (i.e., leaching, chalking, or flaking). The levels of lead in soil from paint deterioration are generally highest along the dripline.

For bare lead contaminated soils in areas expected to be used by children (such as residential back yards, public parks, playgrounds, school yards and other areas where children gather) that are contaminated with lead, USEPA has developed several recommended response activities. Areas with lead concentrations between 400 and 5,000 ppm, USEPA recommends interim controls to change use patterns and establish barriers between children and contaminated soil, monitor condition of interim controls, notification of public by local agency. In areas with lead concentrations above 5,000 ppm in soil, USEPA recommends soil abatement. In areas where contact by children is less likely or infrequent, USEPA recommends interim controls at concentrations between 2,000 and 5,000 ppm lead and abatement at levels above 5,000 ppm (EPAV16). The lead PRGs were developed for recreational and industrial scenarios. A PRG of 1000 ppm was developed for site soils (OHMC08).

Metal structures such as water towers were sandblasted and painted on a regular basis. Sandblasting grit was observed in the soil beneath water tower 67-4 (L107) during the PAS field survey (FIEL01). In addition, spent sandblast grit from water tower maintenance in 1991 or 1992 is known to have been placed in a parking lot immediately south of Group 1, and was spread on agricultural tract 14 (L23). A pile of sand was also observed at the turn in the access road to water tower 67-4 (L107); it is not known if this was spent sand (FIEL01, MEMO09). Sandblasting of structures such as water towers generates fine particles of paint. Metal surfaces were often painted with paints containing heavy metals such as lead for corrosion protection. The sandblasting of an elevated structure has the potential to spread the chips generated over a fairly wide area, but the greatest concentration of chips would be expected immediately beneath the structure. The Army has had the soil beneath several of the water towers tested for the presence of lead. Results will be provided to the future owner when available.

Observations were made during the December 1995 field survey regarding the presence and condition of paint on various surfaces inspected. Several samples were screened using qualitative lead test kits from Carolina Environmental Inc. (Know Lead Test Kits). Paint on the door of Igloo 66-14 was found to contain lead while paint on the interior of 761-11 did not (FIEL01).

Samples from paint chips found on the ground near the loading dock doors of buildings 64-6, 64-7 and 64-8 showed lead levels up to 1,278 mg/kg (DAMO06).

4.11 Explosive Ordnance/Residues

The JOAAP produced, packaged, assembled and loaded explosive constituents. The explosive contamination status of buildings and equipment at JOAAP has been determined in accordance with IOC PAM 385-5 and marked by signs with black letters

on a yellow field indicating the level of contamination. The buildings and equipment are classified as having either 0, 1X, 3X or 5X level of contamination.

Buildings and equipment with a 0 level of contamination were never contaminated with explosives, do not pose an explosive safety hazard, may be welded, drilled, sawed and sold to the public.

A 5X (XXXXX) level of contamination indicates that there is not significant enough amount of contaminant(s) present to pose an explosive safety hazard. A 5X article may be welded, drilled, sawed, etc., and may be sold to the public.

A 3X (XXX) level of contamination indicates that surface contamination has been removed, but significant amounts, posing an explosive safety hazard may still be present in less obvious places. Although 3X articles may be safe for their intended purpose, they should not be subjected to processes that may generate enough heat to ignite residual contamination. A building or piece of equipment with 3X contamination is considered safe for routine maintenance and careful disassembly, but it may not be sold to the general public.

A 1X (X) level of contamination generally applies to articles, equipment and buildings subjected to routine, after-use cleaning. Substantial explosive contamination may exist and maintenance should be limited to minor adjustments.

Each time production was ceased, it was assumed that the equipment and buildings would be needed at some time in the future and should be preserved. Since the equipment and buildings were being retained for their original purpose, the simplest and most economical course of action was to classify all items as "3X" even if the item/article was not contaminated by explosives.

Army regulation 385-64 states that "DOD [Department of Defense] real property that is known to be contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until the most stringent efforts have been made to ensure appropriate protection of the public. Some contamination is, however, so extensive that removal of the hazard is beyond the scope of existing technology and resources. Such properties shall be retained until rendered innocuous."

RIs have identified presence of explosive compounds in soils and groundwater at JOAAP. The findings of the RIs are summarized in Appendix D.

Media contaminated with explosives residues are a special waste and may be a RCRA hazardous waste due the to ignitability or toxicity. There is the possibility that the contaminated media could achieve the PRGs and still be a RCRA hazardous waste. Materials from backstops at the firing ranges would be a special waste if disposed and could be a RCRA hazardous waste due to the presence of lead.

Explosives were stored in one of two types of magazines at JOAAP. Storage magazines were either earthen covered reinforced concrete structures with an entrance at one end (igloos), or aboveground storage magazines constructed of clay block with corrugated asbestos cement roofing. Groups 63 (78 high explosive igloos, L26), 65 (33 smokeless powder igloos, L28), 66 (88 finished ammunition igloos, L29), 66A (41 finished ammunition igloos, L30), 68 (23 fuse, primer, and booster igloos, L13), and the 811 magazine area (132 igloos for storage of TNT, tetryl, DNT and lead azide, M108 and M111) are of the earthen cover design. Group 64 (34 fixed ammunition magazines, L27) is constructed of clay block with corrugated asbestos cement roofing (ACOE06). Some areas were used for outdoor storage of finished munitions. These areas are identified when possible in the IRP site descriptions in Appendix D.

In late 1996, a team from the safety office of IOC conducted inspections of the magazines of several Groups. The purpose of the trip was to reclassify the buildings from XXX to

"0" status where appropriate. All magazines in L26 (Group 63) and L30 (Group 66A) were reclassified as being in "0" condition. In Group 66 (L29) all except 18 of the magazines were reclassified to "0" condition and in the 811 (M108 and M111) area all but 17 were reclassified to "0" condition. Several of the magazines not reclassified are outgranted, which would have required a prior safety approval. JOAAP are currently collecting the outgrant documentation and will then use this information to update the central records. The remaining magazines which remain classified as being in XXX condition, in most cases, could not be inspected due to the presence of items inside hindering visibility. Most of the contents will be removed as part of the on-going liquidation effort and the structures will be inspected when empty. JOAAP has indicated that XXX structures will be secured and will not be transferred until clearance is received (DOTA27).

During the 1995 PAS survey, numerous apparently empty propellant and tracer containers were observed in building 27-17 (L23). Some of the propellant containers are marked 1X. Equipment believed to have been used in production operations was also observed in several of the buildings. The decontamination status of the equipment is not known (FIEL01).

Six buildings in Group 64/L27 were surveyed as part of the December 1995 PAS survey. All six of these buildings have vent spaces at the perimeter base inside the buildings. These vent spaces contain dust and residues that may contain explosive materials or heavy metals from cleaning operations or storage of explosives in these buildings. The other buildings in this group are all of similar construction (FIEL01). Testing of these residues has not been conducted.

During the field survey conducted in December, 1995, TNT field test kits (EM Science, DTECH) were used to analyze four soil samples. Samples were collected at the following locations: 1) Section M111 just north of section M1 - soil and yellowish crystals were collected from a ditch in an area devoid of vegetation, 2) Section M111 at

the southwest corner of the intersection of A Line Road and Prairie Creek Schoolhouse Road - soil collected from a drainage ditch containing dark red water with yellow crystals along the bank, 3) Section M99 - soil collected from inside of secondary clarifier, and 4) section M99 - soil from the TNT block area. All results indicated less than 0.5 ppm of TNT was present in samples (FIEL01).

Dinky cars, small rail cars used for transporting explosives within the MFG area, were serviced in building 718-2. Prior to service, the cars were taken to the railroad spur leading to building 718-2 (north M108) where visible explosive particles were swept off. The sweepings were to be placed in a contaminated materials waste can which was taken to 811-8 for storage (UCCI42).

Trucks and trailers requiring decontamination prior to service were taken to Building 811-8 (M108) or the Explosives Burning Ground (M2) for cleaning. The cleaning involved sweeping the equipment to remove all visible explosive particles. The sweepings were placed in scrap powder containers and placed in 811-8 awaiting disposal or turned over to the Burning Ground attendant (UCCI42).

In late 1995, USEPA conducted soil sampling and analysis on soils at Groups 23, 27, 62, 63, 64, 65, 66, 66A and 68 using the DTECH field screening method. All these Groups are within the agriculture parcel. Forty-four samples were collected including composite, grab, background and spike samples and analyzed for TNT concentrations. All sample results were below the proposed remedial goal of 290 ppm. The highest concentration found during this testing was 3 ppm TNT (WEST01, EPAV04). A detailed description of the sampling is provided in Appendix D.

Throughout the years, waste products (i.e., red water) were discharged to open ditches via lagoons, sumps or underground waste lines. Old plant drawings indicate that broken or leaking underground waste lines were generally replaced with new lines that ran parallel to the old lines. The old lines were abandoned in place (ACOE01).

From 1978 through at least 1993, a magazine was used by law enforcement agencies for the storage of explosive contraband. The contraband was held as evidence until legal actions had been completed and then the material was destroyed off-site (ACOE01, ARMY01). The magazine used for this storage is not known.

Two small arms practice ranges used by the security staff were identified in a 1978 Army document. An outdoor range was located in the southeast corner of the LAP area and an indoor range was located in the southwest corner of the LAP area (ARMY01). The outdoor range (Group 28) located in the southeast corner of the LAP area (L121) was inspected as part of the agriculture parcel. The range consists of a firing area and an earth backstop (FIEL01). This range has been in place for over 50 years and a significant number of lead projectiles are probably embedded in the back stop. The second range is not part of the agriculture parcel. It was reported that UXO should not be present at the ranges (ARMY01). An additional pistol range adjoined the MFG area to the northwest (northwest corner of Drummond Road and Atchison, Topeka and Santa Fe Railroad line) had reportedly not been used for a long time (as of about 1959) (KOWS01, JAAP08). This former pistol range is not within the current boundaries of JOAAP.

The December 1995 and September 1996 field survey identified a possible test range adjacent to Building 61-7. The area includes a backstop and a steel deflector plate. One indentation was noted in the deflector indicating that the area may have been used (FIEL01).

In the 1980s, three indoor test ranges were constructed at Group 8. Small caliber (up to 30 mm) conventional munitions currently are tested in these ranges and munitions with DU projectiles were formerly tested. Spent sand containing projectiles from the range backstops has been periodically removed and stockpiled outside the ranges (L18). Unexploded projectiles are present in the sand piles. Alliant Techsystems is current soliciting bids to define the presence of unexploded ordnance (UXO) and screen the area

to remove all projectiles and fragments (MEMO05). At the time of this report it is not known if the sand piles extend to the edge of the Creek. The DU contamination and clean-up is addressed in Section 4.1.13.

There are several areas at JOAAP where UXO or other explosive items such as fuses or primer may be present. These areas include the burning grounds (L2, L3, and M2), the test range (L11, part of the property to be transferred to the State of Illinois) and the AT-4 test range (L33) (DAMO09, MEMO05). During the Phase 1 RI, 28 projectile fuses, three 40 mm explosive filled grenades and raw explosives were discovered at or near the ground surface and removed from areas L2 and L3. One projectile fuse and other ordnance related material was removed from a stream bank in an area believed free of UXO (DAMO09). Alliant is required to clean-up the AT-4 range in accordance with applicable state and Federal regulations prior to termination of their contract (MEMO05). These areas are not appropriate for transfer at this time and are not discussed further in this document. In addition, UXO may have been scattered by accidents (i.e., detonations) in areas where finished or partially finished munitions were present.

On June 5, 1942, an explosion occurred in and near Building 2-10. It was estimated that 60,000 pounds of TNT and tetryl packed in anti-tank mines (M1) in three box cars on the rail road track adjacent to Building 2-10 and 2,600 pounds of tetryl contained in M1 anti-tank mine fuses in bay 10 of Building 2-10 were within the blast. The maximum distance at which structural damage occurred was 700 feet and missile damage occurred to a distance of 3,700 feet. The explosion resulted in 48 deaths (WDEP01). No details were found concerning UXO clearance, if any, following the explosion. This is the only explosion identified at JOAAP which may have spread UXO. The other explosions and unplanned detonations identified involved unfinished munitions.

A summary of findings relating to UXO and explosives on the land being considered for immediate transfer to USDA is presented in Table 4-10.

4.12 Biomedical/Biohazardous Materials and Wastes

Biological and chemical agents were never developed, tested, manufactured or stored at JOAAP (ARMY01). Two hospitals previously existed at JOAAP but are not located in the agriculture parcel. The hospitals were located in buildings 60-8 (L32) and 705 (M104) (JAAP10, SPED01). In addition, each of the major groups had a first aid station (MAPS06, MAPS11, JAAP10). Due to the period of time that the base has been closed it is unlikely that biohazardous materials remain at any of the former medical facilities.

4.13 Radioactive Materials/Wastes

Several facilities at JOAAP had permits from the Nuclear Regulatory Commission (NRC) for radioactive sources. Isotopic materials were used in analysis of artillery shells or in tracer components. In the past, radiological sources such as cobalt (^{60}Co) and cesium (^{137}Cs) were used in instrumentation within the LAP area Groups 1 (L7), 2 (L8) and 3 (L9). All sources have been removed from JOAAP and NRC license #12-148-28-01 which covered these sources is no longer active (ARMY01).

Depleted uranium (DU) was a component of munitions produced and tested at JOAAP by Alliant Techsystems. DU projectiles manufactured off-site were brought to Group 64 (L27) where they were stored prior to assembly into munitions. During storage in Group 64, the projectiles were in Department of Transportation approved packaging. Munitions with the DU projectiles were assembled in Group 5 (L15) and were test fired at Group 8 (L18). In about 1986, surface scans for radioactivity were conducted by Alliant in Groups 5 and 8. No elevated readings were found. The equipment used for assembly in Group 5 has been removed and shipped off-site for use at other plants (MEMO05).

Activity above the 15 pCi/g NRC cleanup level was found within the perimeter road around Group 8 but away from the stock piled sand. The cleanup will excavate and remove the contamination to an average activity of 15 pCi/g (MEMO05).

DU munitions testing was conducted by Alliant Techsystems at range 3 in Group 8 between 1983 and 1987 (FIEL01, SEGI01). Spent sand from the range was stockpiled outside of the range and some was subsequently moved to the projectile catcher at range 2 where DU contamination was identified. Some of the sand was scattered along the road when the sand was moved from the stockpile to range 2. Some residual contamination was also identified in the sally port of range 1 (SEGI01). Alliant Techsystems is currently conducting a investigation and clean-up of this contamination in accordance with NRC regulations which specify clean-up to an average of 15 pCi/g (SEGI01, MEMO05). Outside areas with readings above 15 pCi/g are all within the Group 8 perimeter road (MEMO05). During the December 1995 survey, numerous large sealed bags containing sand and piles of sand associated with the firing range at which DU munitions were fired were present around the Group 8 perimeter. These bags contained sand from DU clean-up activities. Some of these bags were observed east of Group 8. Alliant reported that 320 cubic yards of sand has been removed and removal of an additional 280 cubic yards is planned. The ongoing remediation of the area and a summary report on the remedial action are scheduled to be completed in the summer of 1996. Testing of the munitions continues to date at this Group. The other two test ranges are currently in operation but have not been used to test DU munitions (FIEL01).

In the first half of 1955, an existing building at the Kankakee Unit (MFG area) was reconverted for use by the Atomic Energy Commission. In addition to reconversion of the building, a guard headquarters was erected and a security fence and appurtenance were installed to provide maximum protection. The entire job was handled as an emergency (HIST49). Argonne National Laboratory leased two buildings (713 in M8 and a portion of 814 in M105) for equipment and machinery storage sometime prior to 1959 under permits issued to the Atomic Energy Commission (HIST24 HIST25). Atomic bomb components were stored in these buildings (FIEL01). In August 1996, USEPA surveyed Buildings 713 and 814 for the presence of radioactive materials. No widespread contamination was encountered in either building. Where elevated radiation

levels were detected, they were localized and except for the stored catalyst in 814 could likely be explained as naturally occurring radioactive materials (EPAV20). It is unclear if the building referred to in the 1955 document is one of those identified as being used for storage in 1959 or is another building. If it was not one of the buildings used for storage, no information is available concerning the activities carried out.

Strontium peroxide (used in tracer rounds) was stored in building 65-6 (JAAP51). A strontium peroxide manufacturer that supplied the material to JOAAP indicated that the material is manufactured form strontium ore and would be expected to contain the same ratio of isotopes as the ore. To the best of their knowledge there is no radiation hazard associated with the strontium peroxide they produced (MEMO16).

4.14 Laboratory Operations

Several laboratories operated at JOAAP to support manufacturing and environmental monitoring operations. An air pollution laboratory, once located near the administration area was closed prior to 1978 and its operations were combined with those of the standards laboratory in Building 704-7 (M8). By 1978, all laboratory operations were conducted in the Standards Laboratory (Section M8, Building 704-7). The Standards Laboratory prepared chemicals used in other JOAAP laboratories during operations, performed influent and effluent water analysis for the STP and tested plant emissions (ARMY01).

Many laboratories were operational at the plant during production years. A 1949 document about the MFG area identifies 19 laboratories, none of which are on property covered by this report (KOWS01). There were four laboratories in the TNT area used for production control and acceptance testing of TNT, DNT and tetryl end products. One TNT laboratory, Building 706-3, was used periodically to test DNT and tetryl products. There were also two laboratories in the tetryl area, two in the lead azide area and one in Acid Area 3. These laboratories were operational through the early 1970s. Wilson

Chemical Company operated a laboratory at the oleum plant in Acid Area 3 from 1958 through 1974. A field laboratory located in Building 4-21 (L14) was used to mix adhesives and sealants used in munitions production through about 1966. Early operations at this laboratory are unknown. Explosives from all the laboratories were destroyed at the burning ground, and liquid wastes were sent to the STP. Some material was reportedly washed into the drainage ditches (ARMY01).

Seven laboratories are or were located on the property slated for transfer to USDA (JAAP10, SPED01, FIEL01). Five general purpose laboratories (706-11, 13, 14, 15, and 16) were located in M105 (JAAP10). A chemical laboratory (Building 71-1) was present at the southwest corner of the intersection of Road $\frac{1}{2}$ South and the set of rail tracks on the eastern corner of Section L113 (SPED06). The building is no longer present (MAPSO6). Broken laboratory glassware and slag were found among foundations at the southwest corner of the intersection of Chicago and Central road in Study area L21 (FIEL01). Evidence (shelving and a small amount of tubing and glassware) indicates the possible presence of a chemical laboratory in Building 709-1 which is located in section M103 (FIEL01).

4.15 Wastewater Treatment and Discharge

Discharges to the waters of the United States are required to comply with 40 CFR 122. Discharge of treated effluent to waters of the State of Illinois must meet the requirements of 35 IAC 309.

Section 2.3.1 provides a general summary of wastewater activities at the JOAAP. The NPDES permit for JOAAP was issued on September 22, 1993 (IL0002666). The facility permit covers 19 discharges to various receiving waters. One of the discharges is the treatment water from the sanitary waste water treatment (Group 20, L20) and the other 18 are stormwater discharges from the facility (DOTA04). Group 20 is currently the only

operating wastewater treatment plant for JOAAP (FIEL01). Around February, 1995 a liquid chlorination system replaced the chlorine gas system at this facility. Ultraviolet light treatment is planned to reduce chlorine concentrations in the plant effluent (JAAP16). Effluent from the secondary settling tanks is discharged directly into Prairie Creek. Sludge is collected from this tank and removed off-site by a contractor (FIEL01). This sludge had previously been disposed at the former sanitary landfill at L21 (ACOE01). Additional information concerning the LAP STP is presented in Appendix D.

Throughout the years, waste products were discharged to open ditches via lagoons, sumps or underground waste lines. Old plant drawings indicate that broken or leaking underground waste lines were generally replaced with new lines that ran parallel to the old lines. The old lines were abandoned in place (ACOE01).

4.16 Surface Water Resources

A general discussion involving surface water resources and discharges to surface water at JOAAP is included in Section 2.5.3. Water and sediment sampling has been conducted in various streams and lakes at JOAAP to determine if site related contaminants are present.

Shallow groundwater discharges to surface water at JOAAP. For example, the groundwater FS for the LAP area indicates that groundwater present in the overburden and within the bedrock at site L1 appears to be discharging to Prairie Creek. Based upon groundwater flow velocity at L2, it is probable that the groundwater contaminant plume extends to Prairie Creek although explosives were not detected in soil or sediment samples from Prairie Creek or Kemery Lake. At L3, a plume of groundwater contamination is present and shallow groundwater discharges to Prairie Creek. At L14, contaminated groundwater appears to be seeping into the storm sewer which discharges to a nearby drainage ditch (DAMO22). It has not been determined what, if any, impact

groundwater discharge to surface water will have on sediment and surface water quality in the future.

The following site related contaminants have been identified on the LAP area in Prairie Creek and Kemery Lake which is considered part of the Prairie Creek system:

Surface water: 1,3,5-trinitrobenzene, RDX, bromodichloromethane, chloroform, nitrate/nitrite, phosphate and aluminum, arsenic, barium, beryllium, calcium, copper, iron, lead, magnesium, nickel, potassium, sodium, vanadium, and zinc.

Sediments: fluoranthene, phenanthrene, pyrene, DDE, DDT, dieldrin, heptachlor, TPHCs, water-soluble sulfate, total phosphate, aluminum, arsenic, copper, lead, potassium, silver, and sodium (DAMO12, DAMO13).

No site related contaminants appear to be migrating from the LAP area or the MFG area via Prairie Creek, although some may have in the past. No contamination was detected in Prairie Creek on the MFG area (DAMO12).

The following site-related contaminants have been identified for Jordan Creek and Doyle Lake:

Surface water: 2,4,6-TNT, HMX, RDX, water soluble sulfate, iron lead, manganese, potassium, silver and sodium.

Sediments: 2,4,6-TNT, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, 2-chloronaphthalene, naphthalene, water-soluble sulfate, lead, silver, sodium and zinc (DAMO13).

The presence of contaminants in Grant Creek appears to be episodic and localized within specific study areas. Identified contaminants of concern in Grant Creek and tributaries are:

Surface water: 2,4,6-TNT, 2,4-dinitrotoluene and 2,6-dinitrotoluene.

Sediment: Fluoranthene, lead and mercury (DAMO26).

The presence of contaminants in Jackson Creek appears to be episodic and localized within specific study areas. Identified contaminants of concern in Jackson Creek are:

Surface water: 1,3-dinitrobenzene, arsenic and sulfate.

Sediment: 2,6-dinitrotoluene, sulfate and lead (DAMO26).

No site-related compounds appear to be present in surface water or sediment in Jackson Creek downstream from the MFG area (DAMO12).

The baseline risk assessment evaluated potential risks to fishermen and resident children coming in contact with water in Jordan, Prairie, Jackson and Grant Creeks, and Kemery Lake. The carcinogenic risks to future fishermen and resident exceeded the 1×10^{-6} criterion for Grant Creek and Kemery Lake. The assessment determined that consumption of fish from Jackson and Grant Creeks and Kemery Lake could potentially result in an unacceptable cancer risk and indicated that fish tissue samples should be collected. The assessment also determined that non-carcinogenic risks for consumers of fish from Prairie Creek and Kemery Lake could potentially result in adverse health impacts (DAMO26).

Fish tissue samples were collected and analyzed for heavy metals, PCBs, pesticides and explosives. Subsequent sampling detected barium, copper, iron and zinc in fish tissue from Grant Creek in the MFG area; iron and zinc in fish tissue from Prairie Creek in the MFG area; barium, iron and zinc in fish tissue from Prairie Creek in the LAP area; and iron and zinc in fish tissue from Doyle Lake. Neither PCBs nor explosives were detected in any of the fish tissue samples. DDE was detected but at levels well below the Food and Drug Administration action level. Following the tissue analysis, it was concluded that "no human health risk is expected from ingesting fish" (AEHA10). No compounds that would contribute the majority of risks if bioaccumulated by fish as hypothesized, were detected in the fish tissue samples.

The aquatic evaluation conducted during the ecological assessment determined that stream health and quality (based on benthic macroinvertebrate analysis) improves as Jackson, Prairie and Grant Creeks flow across JOAAP. The evaluation further concluded that the health of Jordan Creek is unaffected by JOAAP. Spoil Bank Creek quality was moderately low immediately off-post and moderate about one mile off-post (AEHA10).

In the event that any materials are removed from the solid waste disposal sites, it should be noted that soils, sediments, or other media contaminated with hazardous substances or PCBs are considered special wastes pursuant to 35 IAC 808 and 809. When transported on public highways, special wastes must be manifested and the truck must be a licensed special waste hauling vehicle.

In the event that sediments contaminated with hazardous substances are excavated, it should be noted that they would be a special waste and may be a RCRA hazardous waste due to the characteristic of toxicity. There is the possibility that contaminants could meet the PRGs and still exhibit a characteristic of a hazardous waste.

4.17 Soils

A discussion of the soil types at JOAAP is presented in Section 2. A major concern at many of the IR sites is the presence of soil contamination. Discussions of contaminants of concern in soil at the individual IR sites are presented in Appendix D. It should also be noted that wind borne dust, surface water runoff, and/or groundwater migration from the IR sites could result in secondary soil contamination. The possibility of secondary soil contamination will be reduced or eliminated once remedial measures are complete.

When underground waste lines (industrial, sanitary and storm sewers) broke or started leaking, new lines were installed. Generally, the old lines were abandoned in place (ARMY01, ACOE01). When the new TNT lines were constructed, abandoned waste lines were uncovered (ARMY01). Television surveys of the sanitary sewer lines in 1967

revealed leaking sewer lines connected to each of the STPs (AEHA09). The abandoned wastewater lines present a potential continuing source of soil contamination as do prior leakage from leaking or broken lines.

During the December 1995 field survey, dirt mounds scattered around facility of unknown origin were observed. Several mounds contain protruding debris such culverts and pipes and some do not support vegetation (FIEL01). The locations of many of the dirt mounds are presented in Table 4-12.

Wastewater and potentially contaminated stormwater run-off was discharged to ditches located throughout the facility. Periodically, sediment deposited in the ditches was removed to improve flow. The removed sediment was reportedly spread on the ground adjacent to the ditches (FIEL01).

The former pistol range (Group 28) located within L121 consists of a portable building, a firing line, and a soil backstop. A large number of spent shot gun shells, and cartridges were observed near the firing line. Upon impact, lead is abraded from the projectiles and is left in the soil.

4.18 Groundwater

A discussion of groundwater and geological features of the JOAAP is included in Section 2.5 of this report. In summary, only the glacial drift aquifer and the shallow Silurian dolomite aquifers are at or near the ground surface at JOAAP. A deep aquifer, Cambrian-Ordovician aquifer, is utilized at JOAAP.

The Illinois Groundwater Protection Act (Illinois Public Act 85-863) was created to protect the chemical quality of the state's groundwater. This act empowers the IEPA to set quality standards for groundwater within the state. Illinois Groundwater Quality Standards, IAC 35 Subpart D, regulate various aspects of groundwater quality including

establishing criteria for groundwater classification, nondegradation provisions, standards for groundwater quality, and various procedures and protocols for management and protection of groundwater. In accordance with Subpart B of this regulation, all groundwaters of the State of Illinois are designated as one of four classes of groundwaters or a groundwater management zone. The four classes of groundwater are as follows:

Class I:	Potable Resource Groundwater
Class II:	General Resource Groundwater
Class III:	Special Resource Groundwater
Class IV:	Other Groundwater.

The classification of is performed in order to determine the appropriate level of protection and therefore the appropriate groundwater quality standards. Typically, aquifers are assumed to be Class I, and reclassification is required to obtain another classification.

The glacial till aquifer is not utilized at JOAAP. A survey of 214 residential wells conducted by the Army as part of the Phase 2 RI indicated this aquifer is not used in the surrounding area. Elevated concentrations of naturally occurring antimony, calcium, iron, magnesium, manganese, water soluble nitrate/nitrite, sulfates and sodium were found in the glacial till groundwater. This renders the water undesirable for domestic use, and in many cases, agricultural or industrial uses. All of the JOAAP related groundwater contamination is found in the glacial till and portions of the Silurian dolomite aquifer. The contamination is in most cases localized. In addition, the low yield (one gpm) associated with the glacial till aquifer makes it undesirable for any usage. The glacial till groundwater is not considered potable and has been designated a Class II aquifer. The underlying Silurian dolomite aquifer appears to meet the yield requirements for Class I aquifers, although groundwater from the dolomite may require treatment prior to use (DAMO08).

Groundwater contamination has been identified in the glacial till aquifer at the following IRP sites (DAMO08):

M1	Sodium and sulfate
M2	Sodium and sulfate
M3	Organics (non-explosive)
M5	Explosives
M6	Explosives and nitrate/nitrite
M7	Explosives
M10	Toluene
M11	Sodium and sulfate
M12	Sodium and sulfate
M13	Explosives and nitrate/nitrite
L1	Explosives and nitrate/nitrite
L2	Explosives and organics
L3	Explosives
L5	Organics (non-explosive)
L6	Organics (non-explosive)
L10	Explosives
L14	Explosives

The groundwater contamination at M5, M10, M12, L2 (organics), L5, L6, L10 and L14 is considered localized. Groundwater contaminant plumes extend beyond the IRP site boundaries at M1, M2, M7, L1, and L3. The sodium and sulfate plume from M1 extends north, south and west into M111, M112 and M113. The sodium and sulfate plume from M2 extends into M107. A plume of explosives contamination extends into M105 from M7. Plumes of nitrate/nitrite and explosives extend south of L1 through L109 to Prairie Creek. Plumes of explosive contamination extend from L2 and L3 to Prairie Creek. Groundwater contaminant plumes are depicted on Figure 4-2. *Determination of Class II Groundwater* discusses facility-wide groundwater issues (DAMO08). Some descriptive information is available in the IRP site histories in Appendix D. The dolomite aquifer is used by some area residents but most of the users obtain bottled water for drinking due to the objectionable taste and odor of water from this aquifer (DAMO08).

The Cambrian-Ordovician (deep aquifer) is generally, an important source of groundwater in northeastern Illinois and is considered to be a Class I aquifer. At JOAAP this aquifer is used for drinking and industrial uses. Groundwater samples from this aquifer indicate that it has not been impacted by current or previous activities at JOAAP (DAMO08).

There are numerous wells at JOAAP. These include deep production wells, monitoring wells, shallow wells in some of the LAP areas for fire protection and agricultural well pits. The use, modification and abandonment of wells is regulated under the Illinois Well Water Construction Code (Section ILCS 30/1 through 9).

4.19 Noise

JOAAP is located in a rural area and most facilities and operations are removed from residential areas (MAPS08). Some level of construction/demolition noise is anticipated during implementation of remedial actions. The level of noise will vary depending upon the remedy selected.

4.20 Drinking Water

Public water systems are regulated under 40 CFR 141. Public water systems are those that serve 15 or more connections or 25 or more people and whose water is used for drinking, cooking, bathing, or hand washing. Drinking water quality standards, Maximum Contaminant Levels (MCLs), appear in 40 CFR 143. An overview of the water systems at JOAAP was presented in Section 2.3.1.

Samples from the MFG area water supply wells have been collected and analyzed for explosives, anions, and metals. No site related contaminants were detected in the samples. Slightly elevated levels of lead (1.41 µg/L in WSW7) and zinc (125 µg/L in WSW9) were detected but this maybe related to the well casing or the fact that the background wells used for comparison were completed in a different aquifer (DAMO12). Current drinking water wells at JOAAP are deep wells completed in the Cambrian-Ordovician aquifer. Sampling indicates that this aquifer has not been impacted by current or previous activities at JOAAP (DAMO08).

Potable water in the MFG area is obtained from four deep wells (Wells 6, 7, 9, and 10) ranging in depth from 1,569 to 1,649 feet. The wells are located along Base Line Road. Water was pumped to Building 415-1 for chlorination and was then pumped into a 100,000 gallon elevated storage tank. Sampling in 1989 and 1992 found radon-222 in the MFG area water supply at levels up to 120 +/- 20 pCi/L. However, radon levels up to 1,090 pCi/L were found in the distribution system. It is thought that the elevated radon levels may be related to deposits of naturally occurring minerals within the water system. Elevated iron concentrations were found at the administration building and manganese was also detected in the MFG area. Lead exceeded the USEPA action level (15 µg/l) at the administration building (703-5). An ion exchange system was installed to lower the high naturally occurring levels of radium-226 in the potable water (AHEA05).

Potable water in the LAP area is obtained from two deep wells (Wells East and West) ranging in depth from 1,649 to 1,672 feet, respectively. The wells are located near the intersection of Central and Chicago Roads. The water was pumped to a treatment facility where some of the water passed through an ion-exchange unit to lower the hardness and radium-226. The water was then aerated and chlorinated prior to storage in a 1.2 million gallon reservoir. Polyphosphate and soda ash were added for pH and corrosion control when the water was pumped into the reservoir. Sampling in 1989 and 1992 found radon-222 in the LAP area water supplies at levels up to 80 +/- 10 pCi/L. However, radon levels up to 480 pCi/L were found in the distribution system (at the waste water treatment plant). Elevated sodium, chloride and total dissolved solids were found within the distribution system but are thought to be related to the water softening process which utilizes sodium chloride (AHEA05).

Copper piping and lead-containing solder were used in general plumbing applications for many years. The construction and operation of JOAAP coincides with the period during which these materials were used. Thus, it is anticipated that these materials are present in

buildings at JOAAP. In addition, former JOAAP employees have indicated that lead pipes may be present in the Brown Circle area (M102) (ACOE05).

4.21 Perimeter Survey

The surrounding areas of JOAAP are primarily agricultural and residential with limited industry. Most industries on the JOAAP perimeter are located northwest of the facility.

A survey of the JOAAP perimeter was conducted as part of the December, 1995 field survey. The purpose of the survey was to identify, if possible, local industry that may impact environmental conditions at JOAAP. Table 4-11 summarizes the findings of this survey.

A Mobil Oil refinery is located west of section M100. During the field survey, drainage from the Mobil facility was observed to flow via a culvert and seepage through the Atchison Topeka & Santa Fe railroad tracks. The water appeared clear and no vegetative stress was noted (FIEL01).

An industrial park was observed west of JOAAP, east of Route 55 and south of the Mobil facility. A sign at the entrance to this park lists the industries present. The survey team was unable to gain access to the industrial park. The operations conducted at these facilities are unknown. The industries listed were (FIEL01):

Ambitech	BMW	Johnson Control
Consolidated FAB	Brieser Construction	Lindblad
PETROLITE	Chellino Crane	Meade Pritt
Port-O-Let	Conam	NTC
STARCON	Furmanite	Spike Enterprises
TEAM Inc.	Insulco	Hager
Banner Western	J.L. Manta	

An industrial area is located west of Route 53 almost directly across from the current JOAAP administration building (74-3). There are three business located there on property that was formerly a large petroleum facility served by a pipeline. The businesses are Tyler Enterprises which manufactures herbicides and fertilizers, Tyler and Sons which is a grain company, and Tyler Realty (MEMO09).

4.22 Spills

During the operational life of JOAAP, numerous spills of process chemicals have occurred. Quantities of sulfuric and nitric acids, various munitions and dimethylamine (from tetryl production) were released from broken pipes, overflowing or leaking storage tanks and equipment malfunctions. Some of these spills have included, release of acids into local streams. Little information on spills which occurred prior to 1970 is available. Spills occurring in the early 1970s are considered typical of spills which occurred throughout the operation of the facility (ARMY01). One former employee stated that he believed that tank cleaning residues were deposited on the ground near the tank and the acid was neutralized with soda ash (FIEL01). While another former employee indicated that he believed that prior to construction of Acid 4, the waste from cleaning of tanks in the acid area would have been flushed to the Acid Ditch. After Acid 4 was constructed, the waste would have been sent to one of the acid ponds (MEMO13).

Only one spill was identified that is known to have occurred or impacted the property proposed for transfer to USDA under this report. On June 10, 1968, it was determined that oil in Prairie Creek was released from the Group 3 Power house (Building 3-1) via the storm sewer. A heavy coating of oil was present on the sides of the drainage ditch. A drag chain cleaning of the sides of the banks was planned (JAAP26). Documentation was not available to verify that this cleaning was conducted. No surface evidence of the spill was noted during the December 1995 PAS field survey.

4.23 Miscellaneous Findings and Observations

Numerous other findings and observations were made during the field or document review. These findings are presented in Table 4-12.

Group 45 located in PAS study section L112 consisted of six buildings in existence at the time the land was purchased and remodeled for use as an auxiliary fuse loading line in WWII. The line was designed to provide facilities for performing miscellaneous reclaiming operations. The buildings were placed in stand-by status in 1945 (ACOE06). The buildings have since been demolished (BICO01). It is unknown if the buildings were used between 1945 and the time of demolition. Based upon the name of the group and the limited information available, operations in Group 45 may have been similar to early operations at L14 and L15.

A former fire training area was identified north of L18. The boundary of L18 has been expanded to include this area.

Two areas each with about six rows of intermeshed pits measuring about 30 by 5 by 3 feet are present in L106 south of Klinger Cemetery. The purpose of these pits is unknown.

Scattered drums were observed about the property. No environmental concerns were visually apparent relating to the drums.

Lead was commonly used in ceramic coatings. Lead may be present in the ceramic coatings of bath tubs and sinks at JOAAP.

There are numerous foundations scattered about the property. Many of the structures formerly had basements or storm cellars and thus present potential fall hazards.

4.24 Responses to Agricultural Lessee Questionnaire

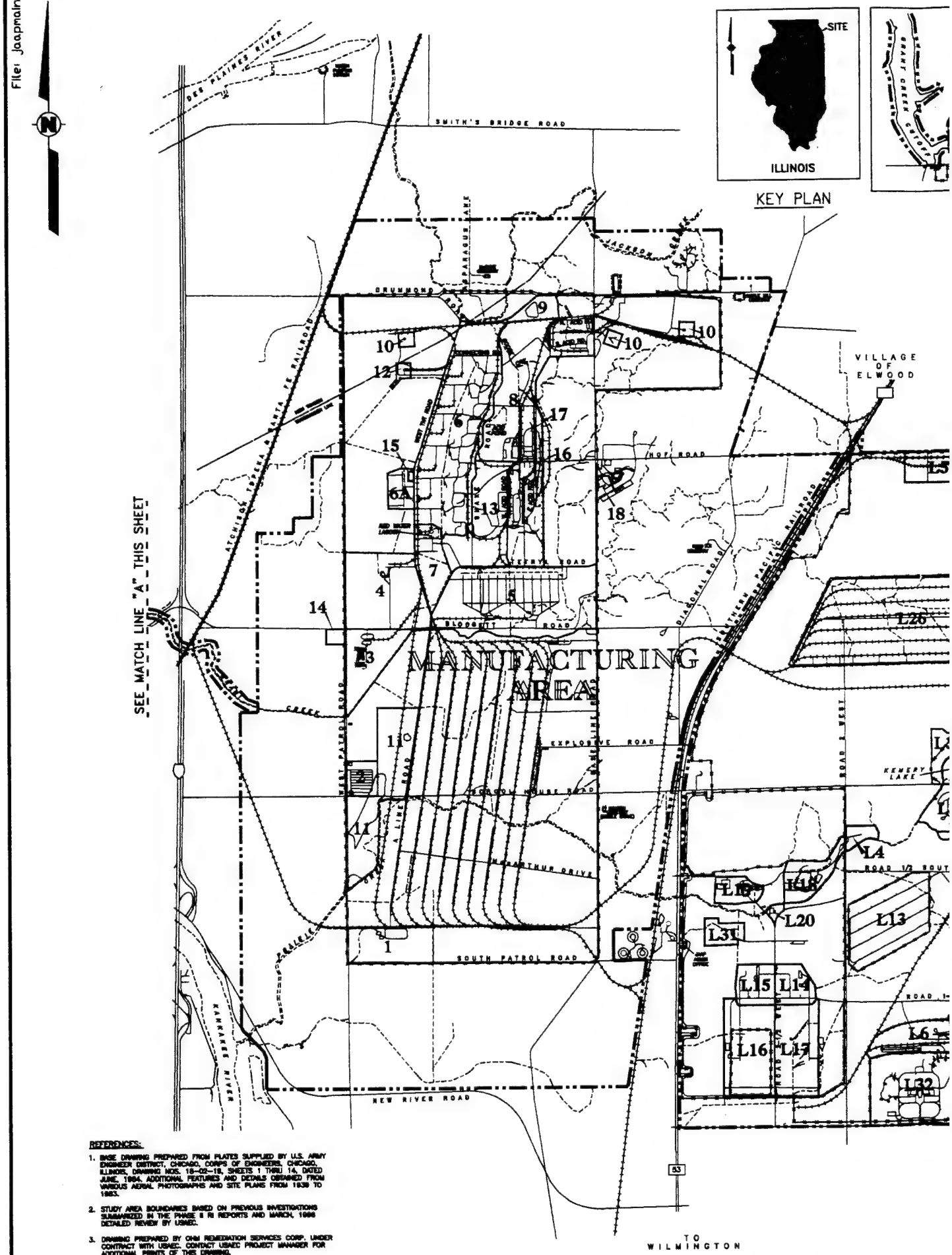
Questionnaires were sent to all 42 current agricultural lessees and 15 questionnaires relating to 25 tracts were completed and returned. Lessees were asked to provide information concerning both current and past leases. Lessees for the following tracts have not observed any potential problems on their tracts as specified in the questionnaire: 23 (LESQ13), 30 (LESQ01), 37 (LESQ02), 48 (LESQ13), 54 (LESQ12), 57 (LESQ04), 60 (LESQ15), 69 (LESQ05), 70 (LESQ03), 76 (LESQ07), 78 (LESQ03), 79 (LESQ13), 108 (LESQ08), 109 (LESQ09), 150 (LESQ03), 154 (LESQ11), 157 (LESQ03), and 169 (LESQ04).

Lessees identified potential concerns relating to seven agricultural tracts. The potential concerns are as follows:

- A former lessee stated that soil excavated from Doyle Lake had been spoiled onto the southwest corner of tract 2 (L121)(LESQ15). Note: Five samples were collected in this tract and were analyzed for metals, explosives anions and PCBs in 1993. No concerns were identified (JAAP12).
- A well was drilled on the north side of tract 3 (L121) by a former lessee (LESQ15).
- Debris (bricks and rebar) were observed in a field on tract 28 (LESQ14).
- Cattle had died on tract 41 (L33) sometime prior to 1968. The deaths were presumably caused by something in a ditch which enters the southeast corner of the tract and flows northwest. USACERL sampling of this area in 1993 revealed no problems (LESQ12).
- The current lessee for tract 68 reported piles of dirt on the west side of the tract which he believes were dumped during the operation of JOAAP (LESQ12).
- A former lessee also noted that soil had been dumped in at a building site on the west side of tract 68 (LESQ15).

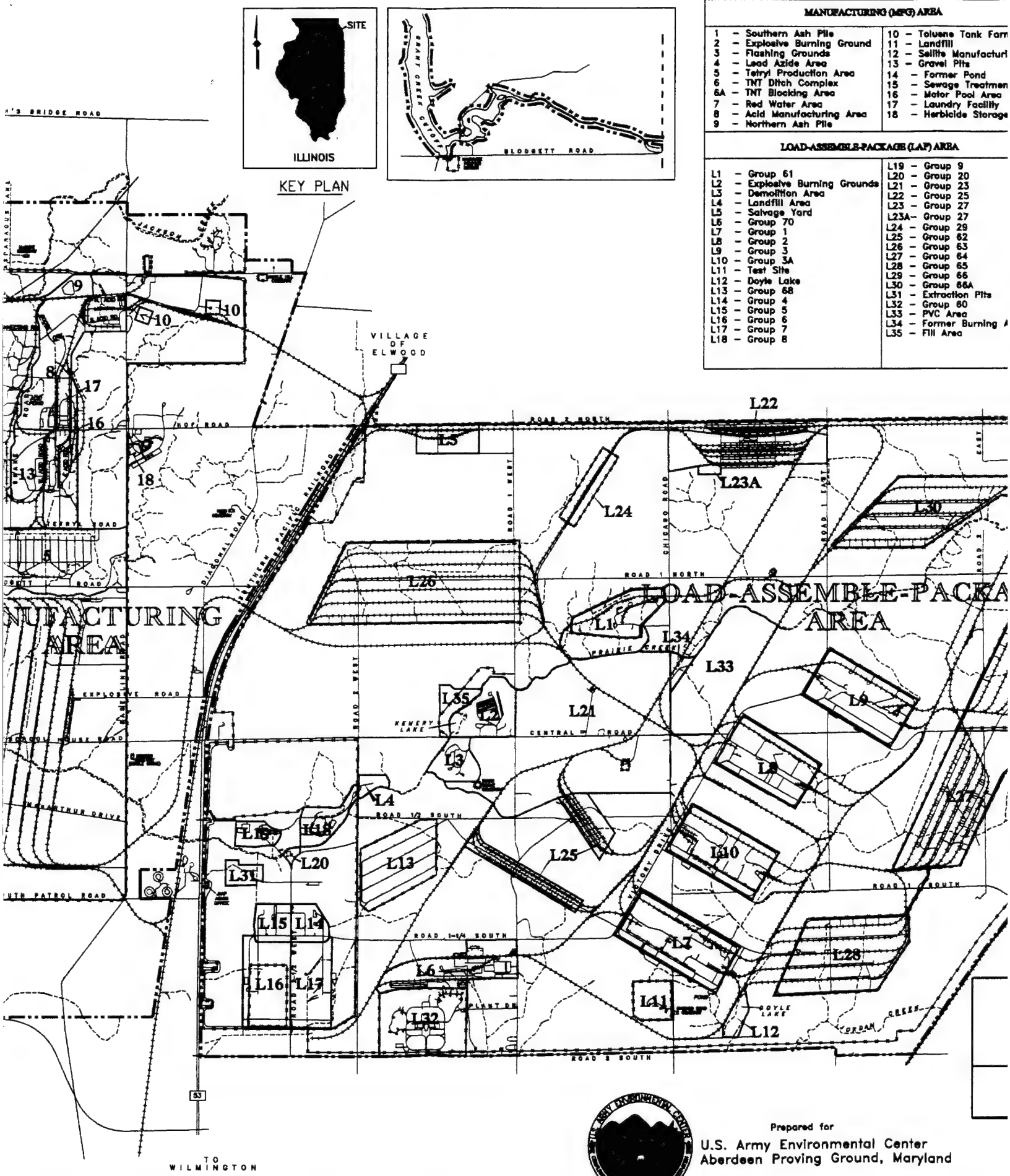
- The tract 110 (M105) lessee observed small pipes on the east side of the tract (LESQ10).
- On tract 111 (M105), the lessee reports a small hole with stained soil around the top. The hole is located near a pond at the east end of the pasture outside of the pasture fence (LESQ10).

File: jaapmain.dwg



REFERENCES:

1. BASE DRAWING PREPARED FROM PLATES SUPPLIED BY U.S. ARMY ENGINEER DISTRICT, CHICAGO, CORPS OF ENGINEERS, CHICAGO, ILLINOIS, DRAWING NOS. 18-02-18, SHEETS 1 THRU 14, DATED JUNE, 1984. ADDITIONAL FEATURES AND DETAILS OBTAINED FROM VARIOUS AERIAL PHOTOGRAPHS AND SITE PLANS FROM 1938 TO 1983.
2. STUDY AREA BOUNDARIES BASED ON PREVIOUS INVESTIGATIONS SUMMARIZED IN THE PHASE II RI REPORTS AND MARCH, 1988 DETAILED REVIEW BY USAEC.
3. DRAWING PREPARED BY OHM REMEDIATION SERVICES CORP. UNDER CONTRACT WITH USAEC. CONTACT USAEC PROJECT MANAGER FOR ADDITIONAL PRINTS OF THIS DRAWING.



STUDY AREA DESCRIPTION

MANUFACTURING (MFG) AREA

1 – Southern Ash Pile	10 – Toluene Tank Farm
2 – Explosive Burning Ground	11 – Landfill
3 – Flashing Grounds	12 – Selfite Manufacturi
4 – Lead Azide Area	13 – Gravel Pits
5 – Tetryl Production Area	14 – Former Pond
6 – TNT Ditch Complex	15 – Sewage Treatmen
6A – TNT Blocking Area	16 – Motor Pool Area
7 – Red Water Area	17 – Laundry Facility
8 – Acid Manufacturing Area	18 – Herbicide Storage
9 – Northern Ash Pile	

LOAD-ASSEMBLE-PACKAGE (LAP) AREA

L1 – Group 61	L19 – Group 9
L2 – Explosive Burning Grounds	L20 – Group 20
L3 – Demolition Area	L21 – Group 23
L4 – Landfill Area	L22 – Group 25
L5 – Salvage Yard	L23 – Group 27
L6 – Group 70	L23A– Group 27
L7 – Group 1	L24 – Group 29
L8 – Group 2	L25 – Group 62
L9 – Group 3	L26 – Group 63
L10 – Group 3A	L27 – Group 64
L11 – Test Site	L28 – Group 65
L12 – Doyle Lake	L29 – Group 66
L13 – Group 68	L30 – Group 66A
L14 – Group 4	L31 – Extraction Pits
L15 – Group 5	L32 – Group 60
L16 – Group 6	L33 – PVC Area
L17 – Group 7	L34 – Former Burning A
L18 – Group 8	L35 – Fill Area

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

STUDY AREA DESCRIPTION

MANUFACTURING (MFG) AREA

1 – Southern Ash Pile
2 – Explosive Burning Ground
3 – Flashing Grounds
4 – Lead Azide Area
5 – Tetryl Production Area
6 – TNT Ditch Complex
6A – TNT Blocking Area
7 – Red Water Area
8 – Acid Manufacturing Area
9 – Northern Ash Pile
10 – Toluene Tank Farms
11 – Landfill
12 – Sellite Manufacturing Area
13 – Gravel Pits
14 – Former Pond
15 – Sewage Treatment Plant
16 – Motor Pool Area
17 – Laundry Facility
18 – Herbicide Storage Area

LOAD-ASSEMBLE-PACKAGE (LAP) AREA

L1 – Group 61
L2 – Explosive Burning Grounds
L3 – Demolition Area
L4 – Landfill Area
L5 – Salvage Yard
L6 – Group 70
L7 – Group 1
L8 – Group 2
L9 – Group 3
L10 – Group 3A
L11 – Test Site
L12 – Doyle Lake
L13 – Group 68
L14 – Group 4
L15 – Group 5
L16 – Group 6
L17 – Group 7
L18 – Group 8
L19 – Group 9
L20 – Group 20
L21 – Group 23
L22 – Group 25
L23 – Group 27
L23A– Group 27
L24 – Group 29
L25 – Group 62
L26 – Group 63
L27 – Group 64
L28 – Group 65
L29 – Group 66
L30 – Group 66A
L31 – Extraction Pits
L32 – Group 60
L33 – PVC Area
L34 – Former Burning Area
L35 – Fill Area

LEGEND

- JOLIET ARMY AMMUNITION PLANT BOUNDARY
- ROAD OR PARKING AREA
- SEASONAL ROAD OR TRAIL
- RAILROAD
- FENCE
- DRAINAGE FEATURE
- 1 — MANUFACTURING AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- L1 — LOAD–ASSEMBLE–PACKAGE AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- 14 — HISTORICAL STUDY AREA BOUNDARY AND IDENTIFICATION

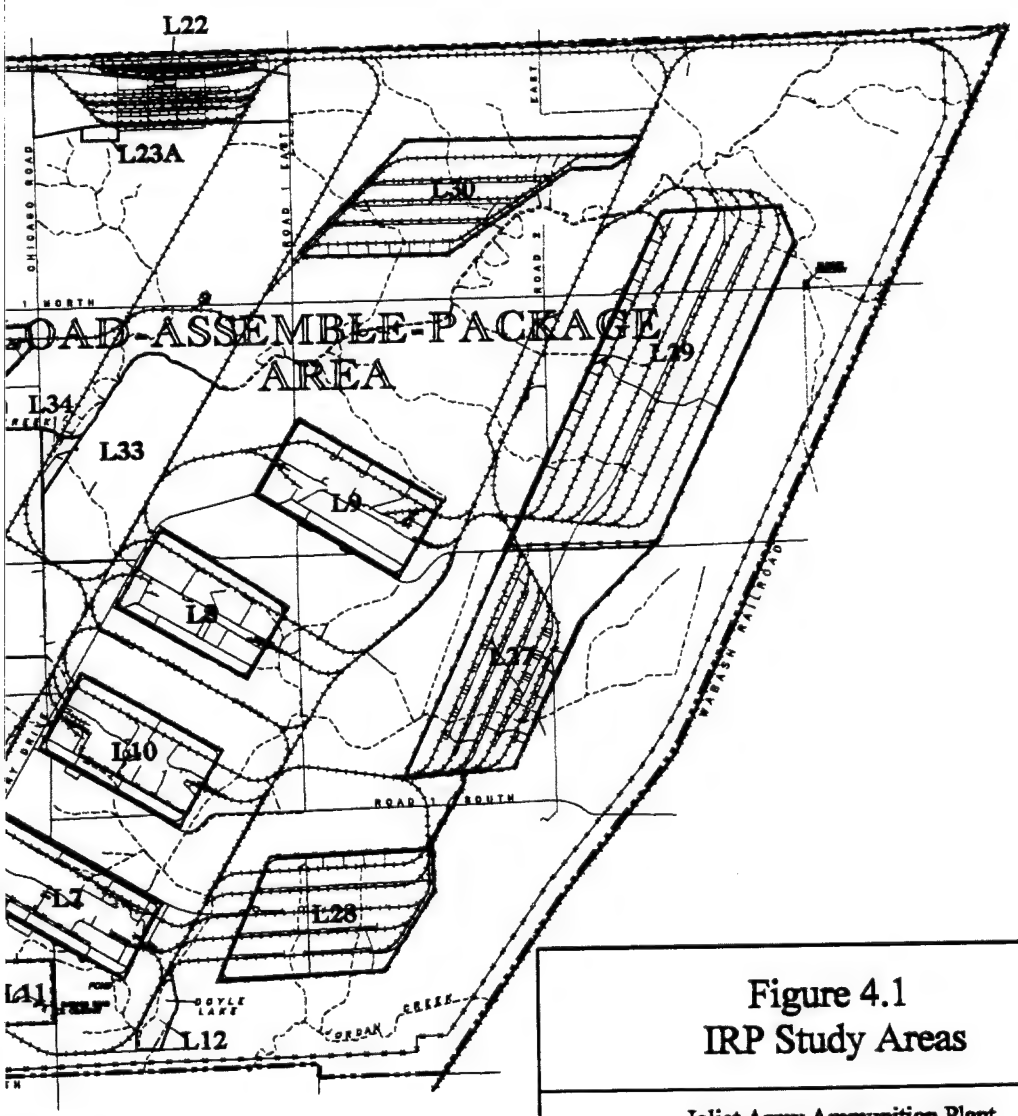


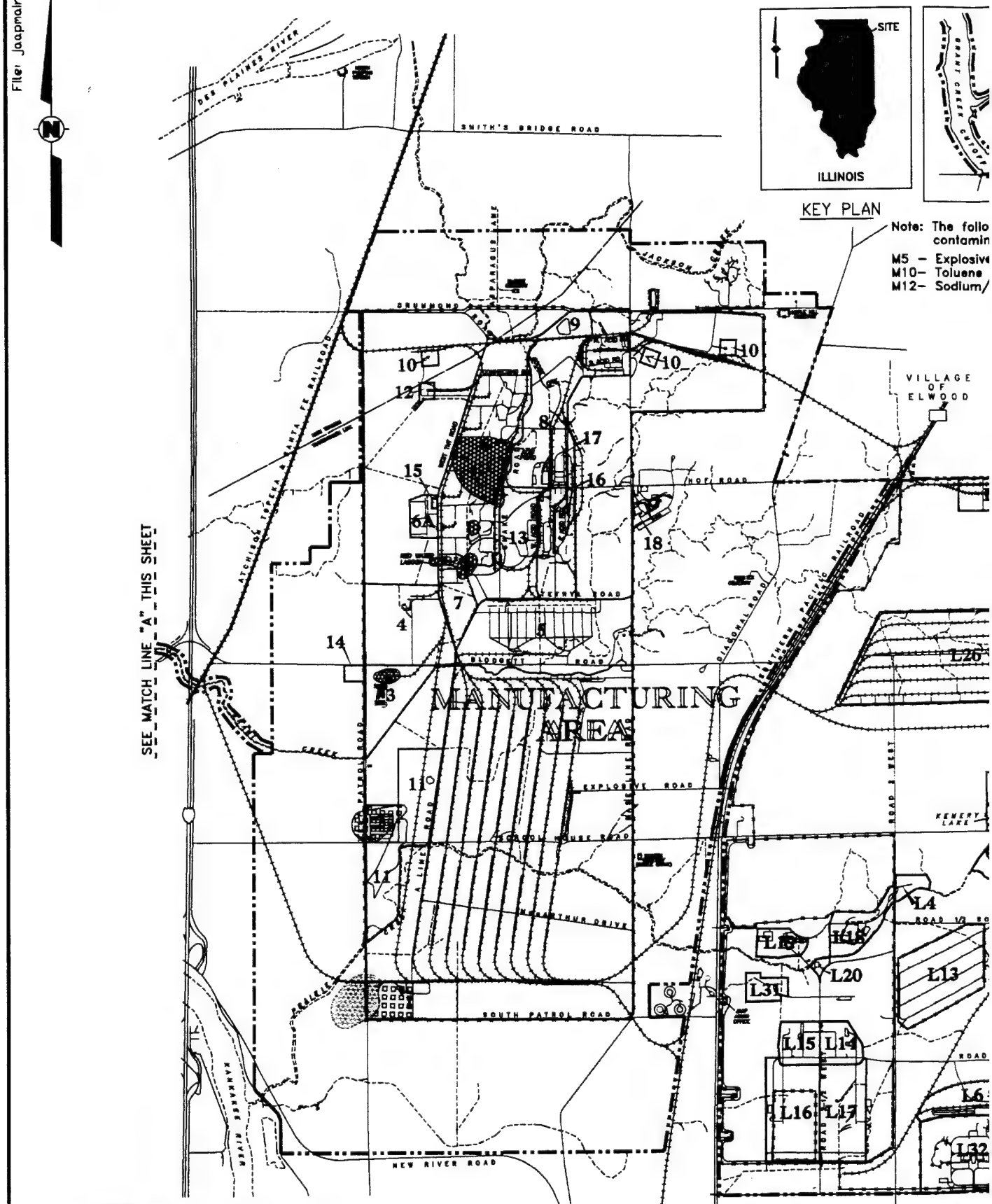
Figure 4.1
IRP Study Areas

Joliet Army Ammunition Plant
Will County, Illinois

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

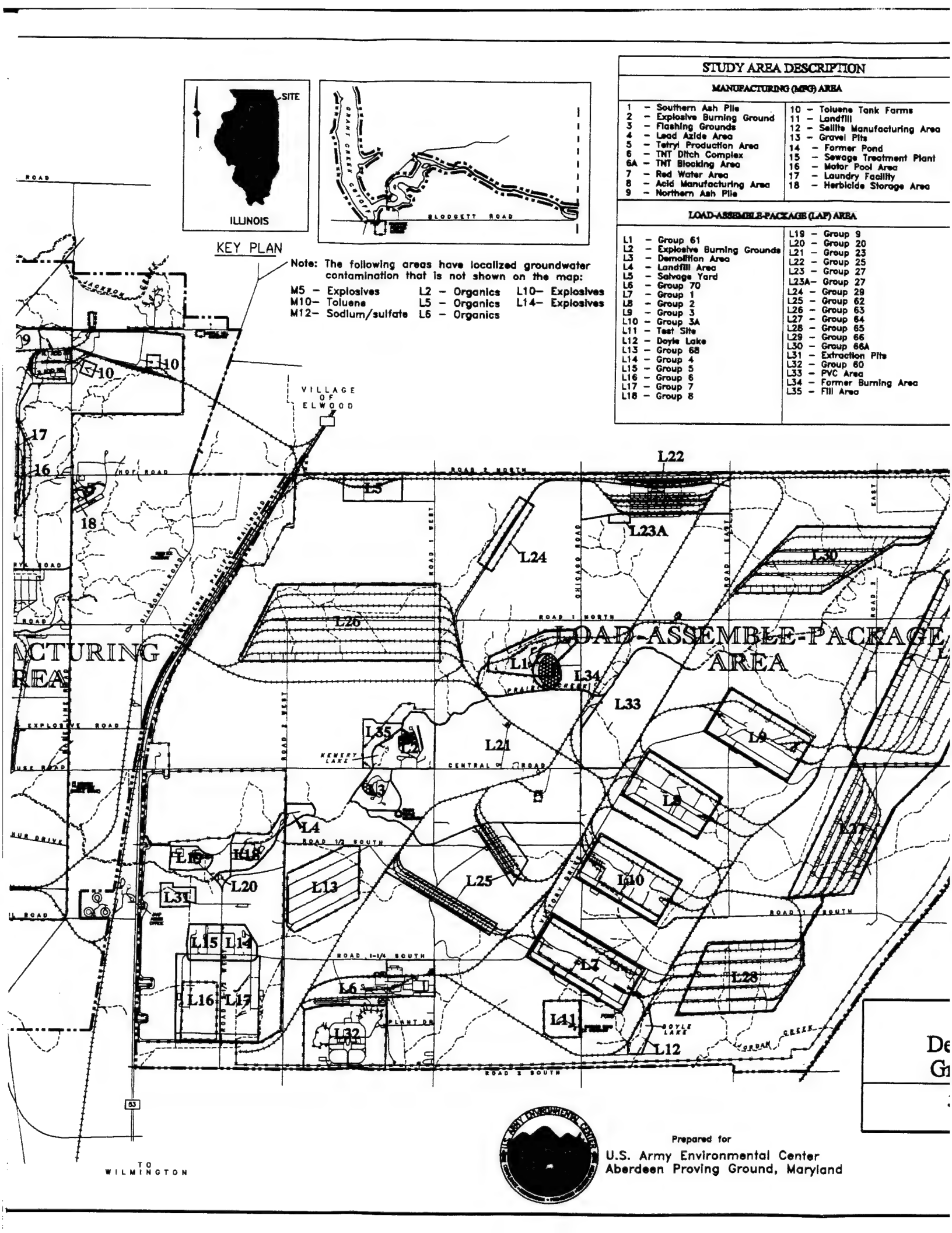
PLEXUS scientific

File: Jaapmain.dwg



REFERENCES:

1. BASE DRAWING PREPARED FROM PLATES SUPPLIED BY U.S. ARMY ENGINEER DISTRICT, CHICAGO, CORPS OF ENGINEERS, CHICAGO, ILLINOIS, DRAWING NOS. 18–02–19, SHEETS 1 THRU 14, DATED JUNE, 1984. ADDITIONAL FEATURES AND DETAILS OBTAINED FROM VARIOUS AERIAL PHOTOGRAPHS AND SITE PLANS FROM 1939 TO 1983.
2. STUDY AREA BOUNDARIES BASED ON PREVIOUS INVESTIGATIONS SUMMARIZED IN THE PHASE II RI REPORTS AND MARCH, 1986 DETAILED REVIEW BY USAEC.
3. DRAWING PREPARED BY OHM REMEDIATION SERVICES CORP. UNDER CONTRACT WITH USAEC. CONTACT USAEC PROJECT MANAGER FOR ADDITIONAL PRINTS OF THIS DRAWING.
4. SOURCE DAMOOS.


SITE
ILLINOIS
KEY PLAN
GRANT CREEK
BLODGETT ROAD
Note: The following areas have localized groundwater contamination that is not shown on the map:
M5 – Explosives
M10– Toluene
M12– Sodium/sulfate
L2 – Organics
L5 – Organics
L6 – Organics
L10– Explosives
L14– Explosives
STUDY AREA DESCRIPTION
MANUFACTURING (MFG) AREA
1 – Southern Ash Pile
2 – Explosive Burning Ground
3 – Flashing Grounds
4 – Lead Azide Area
5 – Tetryl Production Area
6 – TNT Ditch Complex
6A – TNT Blocking Area
7 – Red Water Area
8 – Acid Manufacturing Area
9 – Northern Ash Pile
10 – Toluene Tank Farms
11 – Landfill
12 – Sellite Manufacturing Area
13 – Gravel Pits
14 – Former Pond
15 – Sewage Treatment Plant
16 – Motor Pool Area
17 – Laundry Facility
18 – Herbicide Storage Area
LOAD-ASSEMBLE-PACKAGE (LAP) AREA
L1 – Group 61
L2 – Explosive Burning Grounds
L3 – Demolition Area
L4 – Landfill Area
L5 – Salvage Yard
L6 – Group 70
L7 – Group 1
L8 – Group 2
L9 – Group 3
L10 – Group 3A
L11 – Test Site
L12 – Doyle Lake
L13 – Group 68
L14 – Group 4
L15 – Group 5
L16 – Group 6
L17 – Group 7
L18 – Group 8
L19 – Group 9
L20 – Group 20
L21 – Group 23
L22 – Group 25
L23 – Group 27
L23A– Group 27
L24 – Group 29
L25 – Group 62
L26 – Group 63
L27 – Group 64
L28 – Group 65
L29 – Group 66
L30 – Group 66A
L31 – Extraction Pits
L32 – Group 60
L33 – PVC Area
L34 – Former Burning Area
L35 – Fill Area
VILLAGE OF ELWOOD
ROAD 2 NORTH
ROAD 1 WEST
ROAD 1 EAST
ROAD 1 NORTH
ROAD 1/2 SOUTH
ROAD 1 SOUTH
ROAD 1-1/4 SOUTH
ROAD 2 SOUTH
CHICAGO ROAD
DIAGONAL ROAD
EXPLOSIVE ROAD
PLANT RD
VICTORY ROAD
KEMERY LAKE
PRAIRIE CREEK
DOYLE LAKE
JORDAN CREEK
L22
L23A
L24
L30
L26
L1
L34
L33
L9
L8
L37
L35
L2
L21
L3
L4
L18
L19
L20
L31
L13
L25
L10
L15
L14
L7
L28
L16
L17
L6
L41
L32
L12
TO WILMINGTON
Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

STUDY AREA DESCRIPTION

MANUFACTURING (MFG) AREA

1 – Southern Ash Pile	10 – Toluene Tank Farms
2 – Explosive Burning Ground	11 – Landfill
3 – Flashing Grounds	12 – Sellite Manufacturing Area
4 – Lead Azide Area	13 – Gravel Pits
5 – Tetryl Production Area	14 – Former Pond
6 – TNT Ditch Complex	15 – Sewage Treatment Plant
6A – TNT Blocking Area	16 – Motor Pool Area
7 – Red Water Area	17 – Laundry Facility
8 – Acid Manufacturing Area	18 – Herbicide Storage Area
9 – Northern Ash Pile	

LOAD-ASSEMBLE-PACKAGE (LAP) AREA

L1 – Group 61	L19 – Group 9
L2 – Explosive Burning Grounds	L20 – Group 20
L3 – Demolition Area	L21 – Group 23
L4 – Landfill Area	L22 – Group 25
L5 – Salvage Yard	L23 – Group 27
L6 – Group 70	L23A– Group 27
L7 – Group 1	L24 – Group 29
L8 – Group 2	L25 – Group 62
L9 – Group 3	L26 – Group 63
L10 – Group 3A	L27 – Group 64
L11 – Test Site	L28 – Group 65
L12 – Doyle Lake	L29 – Group 66
L13 – Group 68	L30 – Group 66A
L14 – Group 4	L31 – Extraction Pits
L15 – Group 5	L32 – Group 60
L16 – Group 6	L33 – PVC Area
L17 – Group 7	L34 – Former Burning Area
L18 – Group 8	L35 – Fill Area

LEGEND

- JOLIET ARMY AMMUNITION PLANT BOUNDARY
- ROAD OR PARKING AREA
- SEASONAL ROAD OR TRAIL
- RAILROAD
- FENCE
- DRAINAGE FEATURE
- [1] MANUFACTURING AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- [L1] LOAD-ASSEMBLE-PACKAGE AREA, STUDY AREA BOUNDARY AND IDENTIFICATION
- [14] HISTORICAL STUDY AREA BOUNDARY AND IDENTIFICATION

GROUNDWATER PLUMES

- EXPLOSIVES
- NITRIATE/NITRITE
- SODIUM & SULFATE
- SODIUM
- ORGANICS (NON-EXPLOSIVE)

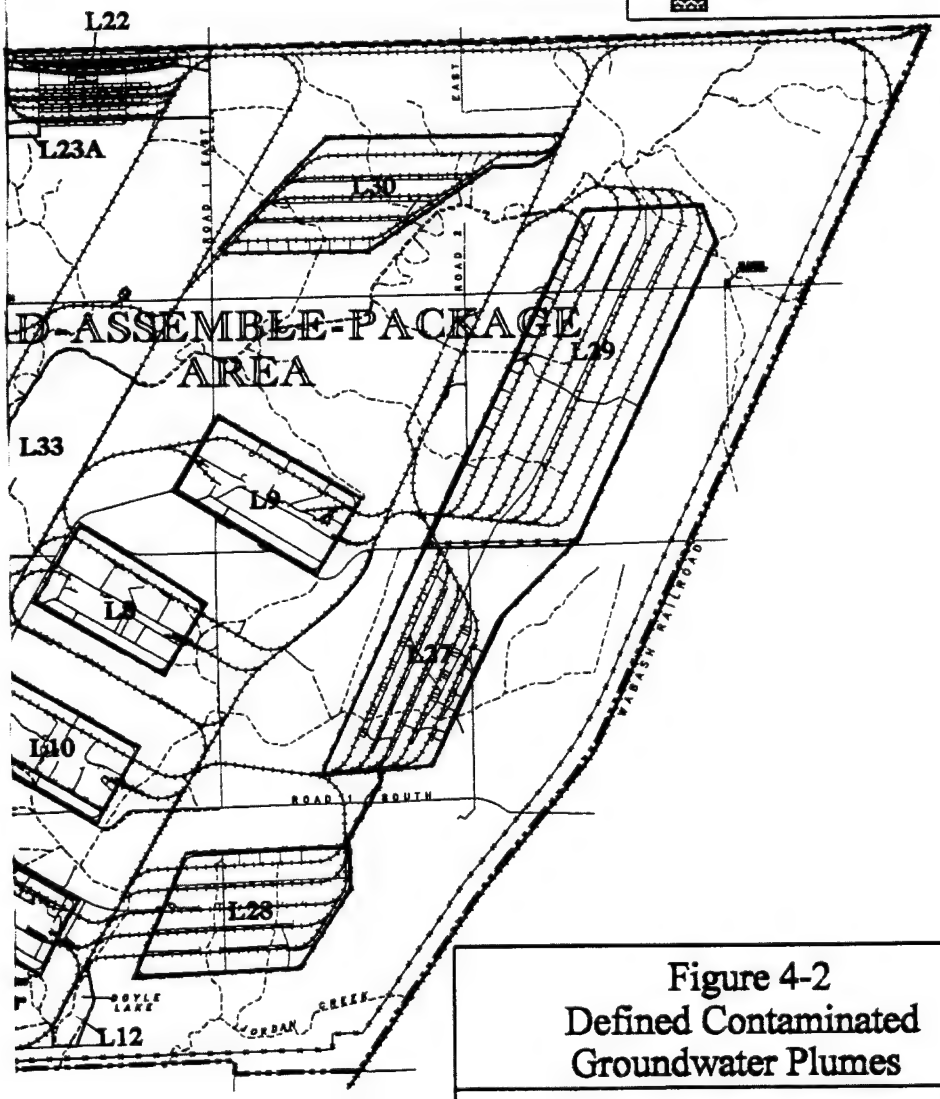


Figure 4-2
Defined Contaminated Groundwater Plumes

Joliet Army Ammunition Plant
Will County, Illinois

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

PLEXUS scientific

TABLE 4-1
IR AND MAJOR OPERATIONAL AREAS
JOAAP, WILL COUNTY, ILLINOIS

PAS Study Section	IR Site Number	IR Site Name	Group Number	Functional Title
MFG Area				
M1	1	Southern Ash Pile		
M2	2	Explosive Burning Ground		
M3	3	Flashing Grounds		
M4	4	Lead Azide Area		
M5	5	Tetryl Production Area		
M6	6	TNT Ditch Complex		
M7	7	Red Water Area		
M8	8	Acid Manufacturing Area		
M9	9	Northern Ash Pile		
M10	10	Toluene Tank Farms		
M11	11	Landfill		
M12	12	Sellite Manufacturing Area		
M13	13	Gravel Pits		
M14	14	Former Pond Area		
M15	15	Sewage Treatment Plant		
M16	16	Motor Pool Area		
M17	17	Laundry Facility		
M18	18	Herbicide Storage Area		
M6A/M99				TNT Block Area
M111				South Railroad Classification Yard
M108/M111				811 Magazine Area
M102				Brown Circle Residences
LAP Area				
L1	L1	Group 61	61	Shell Renovation Plant
L2	L2	Explosive Burning Ground	23	Surface Storage Reservoir Area
L3	L3	Demolition Area	23	
L4	L4	Landfill Area		
L5	L5	Salvage Yard	26	Salvage Yard
L6	L6	Group 70	70	Shop Area
L7	L7	Group 1	1	Semi-fixed & Fixed Ammunition Loading Line
L8	L8	Group 2	2	Medium Caliber Loading Line
L9	L9	Group 3	3	Demolition Bomb & Fixed Ammunition Loading Line
L10	L10	Group 3A	3A	Demolition Bomb & Experimental Loading Line
L11	L11	Test Site		
L12	L12	Doyle Lake		
L13	L13	Group 68	68	Fuse-Booster-Primer Magazine Area

TABLE 4-1
IR AND MAJOR OPERATIONAL AREAS
JOAAP, WILL COUNTY, ILLINOIS

PAS Study Section	IR Site Number	IR Site Name	Group Number	Functional Title
L14	L14	Group 4	4	Fuse Loading Line
L15	L15	Group 5	5	Fuse Loading Line
L16	L16	Group 6	6	Booster Loading Line
L17	L17	Group 7	7	Booster Loading Line
L18	L18	Group 8	8	Primer Loading Line
L19	L19	Group 9	9	Detonator Loading Line
L20	L20	Group 20	20	Sewage Treatment Area
L21	L21	Group 23	23	Surface Storage Reservoir Area/Burning Ground/ Miscellaneous Buildings
L22	L22	Group 25	25	RR Classification Yard
L23	L23	Group 27	27	Inert Storage Warehouses
L24	L24	Group 29	29	High Explosive Classification Yard
L25	L25	Group 62	62	Inert Material Storage Area
L26	L26	Group 63	63	High Explosive Magazine Area
L27	L27	Group 64	64	Standard Fixed Ammunition Storage Area
L28	L28	Group 65	65	Smokeless Powder Magazine Area
L29	L29	Group 66	66	Finished Ammunition Storage Area
L30	L30	Group 66A	66A	Finished Ammunition Storage Area
L31	L31	Extraction Pits		
L32	L32	Group 60	60	Administration Group Area
L33	L33	PVC Area	41	AT-4 Test Range
L34	L34	Former Burning Area		
L35	L35	Fill Area		
L103			21	North Transformer/Substation
L6			22	South Transformer/Substation
L21			24	Fire Station
L121			28	Pistol Range
L112			45	Auxiliary Fuse Loading Line
Various			67	Radio Transmitter/ Water Towers
Various			71	Chemical Lab/Miscellaneous Buildings
L115			73	Construction Headquarters/Residence
L100/L111/ L112			74	Residences along Route 66
Various			86	Road Bridges
Various			87	Railroad Structures

Sources: (JAAP11, SPED01, DAMO11, DAMO12)

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
M1						
Current	Maintenance worker	Soil	Ingestion, Inhalation		5.8E-10	1.2E-04
		Sediment	Ingestion, Inhalation		NC	1.0E-06
		Surface water	Dermal		9.5E-09	3.5E-04
		Ash	Ingestion, Inhalation		1.1E-08	6.5E-05
	Security worker	Soil	Ingestion, Inhalation		5.8E-11	1.2E-05
		Sediment	Ingestion, Inhalation		NC	1.0E-07
		Surface water	Dermal		9.5E-09	3.5E-04
		Ash	Ingestion, Inhalation		1.1E-09	6.5E-06
Future	Maintenance worker	Soil	Ingestion, Inhalation		1.1E-08	2.3E-03
		Sediment	Ingestion, Inhalation		NC	1.9E-05
		Ash	Ingestion, Inhalation		2.0E-07	1.2E-03
	Construction worker	Soil	Ingestion, Inhalation		4.2E-09	1.0E-02
		Sediment	Ingestion, Inhalation		NC	9.4E-05
		Groundwater	Ingestion		NC	8.2E-03
		Ash	Ingestion, Inhalation		7.6E-08	5.8E-03
	Residents	Soil	Ingestion, Inhalation		6.5E-08	1.2E-02
		Sediment	Ingestion, Inhalation		NC	9.7E-05
		Groundwater	Ingestion, Inhalation, Dermal	Antimony	NC	3.1E+00
		Ash	Ingestion, Inhalation	2,6-DNT	1.2E-06	6.0E-03
	Resident child	Surface water	Dermal		1.6E-07	4.7E-03
M2						
Current	Maintenance worker	Soil	Ingestion, Inhalation		3.7E-09	7.8E-04
	Security worker	Soil	Ingestion, Inhalation		3.7E-10	7.8E-05
Future	Maintenance worker	Soil	Ingestion, Inhalation		6.9E-08	1.5E-02
	Construction worker	Soil	Ingestion, Inhalation		4.5E-07	2.9E-01
		Soil (hotspot)	Ingestion, Inhalation	2,4-DNT, 2,4,6-TNT	2.4E-06	1.6E+00
		Groundwater	Ingestion		NC	NC
	Industrial worker	Soil	Ingestion, Inhalation		4.6E-08	9.8E-03
	Residents	Soil	Ingestion, Inhalation		4.1E-07	7.3E-02
		Groundwater	Ingestion, Inhalation, Dermal		NC	NC
M3						
Current	Maintenance worker	Soil	Ingestion, Inhalation, Dermal	Lead, 2,4,6-TNT	1.2E-07	7.4E-02
	Security worker	Soil	Ingestion, Inhalation, Dermal	Lead, 2,4,6-TNT	9.7E-08	6.0E-02
Future	Maintenance worker	Soil	Ingestion, Inhalation, Dermal	Lead, 2,4,6-TNT, 1,3,5-DNB	2.3E-06	1.5E+00
	Construction worker	Soil	Ingestion, Inhalation, Dermal	Cadmium, Nickel, 2,4,6-TNT, Lead	3.5E-06	2.9E+00
		Groundwater	Ingestion		9.6E-10	3.2E-05
	Industrial worker	Soil	Ingestion, Inhalation, Dermal	Lead, 1,3,5-DNB	1.5E-06	1.1E+00
	Residents	Soil	Ingestion, Inhalation, Dermal	2,4,6-TNT, 2,4-DNT, 2,6-DNT, 1,3,5-TNB, Antimony, Lead, Thallium	1.4E-05	7.2E+00
		Groundwater	Ingestion, Inhalation, Dermal	Benzene	1.4E-05	2.5E-01
M4						
No risks could be calculated for this site as cancer slope factors and RfDs were not available for the contaminants of concern.						
Lead is a concern for both current and future receptors exposed to soil.						
M5						
Current	Maintenance worker	Soil (E-W ditch)	Ingestion, Inhalation	Lead	2.6E-07	3.5E-01
		Soil (Tetryl Line)	Ingestion, Inhalation		1.4E-07	1.1E-02
		Sediment	Ingestion, Inhalation, Dermal		2.5E-07	7.3E-05
	Security worker	Soil (E-W ditch)	Ingestion, Inhalation	Lead	2.6E-08	3.5E-02
		Soil (Tetryl Line)	Ingestion, Inhalation		1.4E-08	1.1E-03
		Sediment	Ingestion, Inhalation, Dermal		7.4E-07	7.3E-06
	Hunter	Soil (E-W ditch)	Ingestion, Inhalation	Tetryl, Lead	9.4E-07	1.1E+00
		Sediment	Ingestion, Inhalation, Dermal		8.9E-07	2.2E-04
Future	Maintenance worker	Soil (E-W ditch)	Ingestion, Inhalation	2,6-DNT, 2,4-DNT, 2,4,6-TNT, Tetryl, Lead	4.9E-06	6.6E+00
		Soil (Tetryl Line)	Ingestion, Inhalation	2,4-DNT	2.6E-06	2.1E-01
		Sediment	Ingestion, Inhalation, Dermal	PCB 1254	4.6E-06	1.4E-03
M5						
Future	Industrial worker	Soil (E-W ditch)	Ingestion, Inhalation	2,6,-DNT, 2,4-DNT, 2,4,6-TNT, Tetryl, Lead	3.3E-06	4.4E+00

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
M5						
Future	Industrial worker	Soil (Tetryl Line)	Ingestion, Inhalation	2,4-DNT	1.8E-06	1.4E-01
		Sediment	Ingestion, Inhalation, Dermal	PCB 1254	5.5E-06	9.1E-04
	Construction worker	Soil (E-W ditch)	Ingestion, Inhalation	2,6-DNT, 2,4-DNT, 2,4,6-TNT, Tetryl, Lead	1.1E-06	2.0E+00
		Soil (Tetryl Line)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT	4.5E-06	9.5E+00
		Sediment	Ingestion, Inhalation, Dermal		6.6E-07	1.2E-02
		Groundwater	Ingestion		9.2E-09	3.2E-03
	Resident	Soil (E-W ditch)	Ingestion, Inhalation	2,6-DNT, 2,4-DNT, 2,4,6-TNT, Tetryl, Lead	2.9E-05	3.3E+01
		Soil (Tetryl Line)	Ingestion, Inhalation	1,3-DNB, 2,4-DNT	1.5E-05	1.0E+00
		Sediment	Ingestion, Inhalation, Dermal	PCB 1254	1.4E-05	6.8E-03
		Groundwater	Ingestion, Inhalation, Dermal	2,6-DNT, 2,4,6-TNT, 2,4-DNT, 1,3,5-DNB	5.3E-05	2.4E+00
	Resident child	Surfece water	Dermal		1.7E-09	2.4E-03
M6						
Current	Maintenance worker	Soil (TNT ditch)	Ingestion, Inhalation	2,6-DNT, 2,4,6-TNT, 2,4-DNT	4.4E-05	4.9E+00
		Soil (other)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	1.4E-05	1.7E+00
		Sediment	Ingestion, Inhalation		7.7E-07	8.7E-02
		Sediment (hotspot)	Ingestion, Inhalation	2,4,6-TNT	1.6E-06	2.7E-01
	Security worker	Soil (TNT ditch)	Ingestion, Inhalation	2,6-DNT, 2,4,6-TNT, 2,4-DNT	4.4E-06	4.9E-01
		Soil (other)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	1.4E-06	1.7E-01
		Sediment	Ingestion, Inhalation		7.7E-08	8.7E-03
		Sediment (hotspot)	Ingestion, Inhalation		1.7E-07	2.7E-02
Future	Maintenance worker	Soil (TNT ditch)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	8.3E-04	9.3E+01
		Soil (other)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	2.7E-04	3.2E+01
		Sediment	Ingestion, Inhalation	2,4,6-TNT, Benzo(b)fluoranthene, Benzo(a)pyrene, Chrysene, Benzo(a)anthracene, 2,4-DNT	1.4E-05	1.6E+00
		Sediment (hotspot)	Ingestion, Inhalation		3.0E-05	5.1E+00
	Construction worker	Soil (TNT ditch)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	3.2E-04	4.4E+02
		Soil (other)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	6.5E-05	9.8E+01
		Sediment	Ingestion, Inhalation	2,4,6-TNT, Benzo(a)fluoranthene, Benzo(a)pyrene, Chrysene	5.9E-06	7.9E+00
		Sediment (hotspot)	Ingestion, Inhalation		1.1E-05	2.5E+01
		Groundwater (N plume)	Ingestion	2,4-DNT	2.1E-06	2.2E-01
		Groundwater (Ctr plume)	Ingestion		1.7E-09	5.9E-05
		Groundwater (S plume)	Ingestion		9.1E-08	1.9E-04
	Industrial worker	Soil (TNT ditch)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	5.4E-04	6.2E+01
		Soil (other)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT	1.8E-04	2.2E+01
		Sediment	Ingestion, Inhalation	2,4,6-TNT, Benzo(b)fluoranthene, Benzo(a)pyrene, Benzo(a)anthracene, 2,4 DNT, Chrysene	9.6E-06	1.1E+00
		Sediment (hotspot)	Ingestion, Inhalation		2.1E-05	3.4E+00
	Resident	Soil (TNT ditch)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT, 1,3,5-TNB	4.9E-03	4.6E+02
		Soil (other)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 2,6-DNT, 1,3,5-TNB	1.6E-03	1.6E+02
		Sediment	Ingestion, Inhalation	2,4,6-TNT, Benzo(b)fluoranthene, Benzo(a)anthracecene, 2,4-DNT, Benzo(a)Pyrene, Chrysene	8.6E-05	8.1E+00
		Sediment (hotspot)	Ingestion, Inhalation		1.8E-04	2.5E+01
		Groundwater (N plume)	Ingestion, Inhalation, Dermal	2,4-DNT, 2,6-DNT, 2,4,6-TNT, RDX, 1,3,5-TNB	1.3E-02	1.3E+02
		Groundwater (Ctr plume)	Ingestion, Inhalation, Dermal	2,4-DNT, 2,6-DNT	9.7E-06	2.3E-02
		Groundwater (S plume)	Ingestion, Inhalation, Dermal	2,6-DNT, 2,4-DNT, 2,4,6-TNT, RDX, Nitrobenzene	5.3E-04	3.5E+00
	Resident child	Surface water	Dermal	2,6-DNT, 2,4-DNT	6.3E-06	2.9E-01

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
M7						
Current	Maintenance worker	Soil (TNT ditch)	Ingestion, Inhalation		1.5E-08	1.9E-03
		Soil (open tank area)	Ingestion, Inhalation	2,4,6-TNT	1.4E-05	2.6E+00
		Sediment	Ingestion, Inhalation		1.7E-08	3.0E-04
		Surface water (small intermittent pond)	Ingestion, Inhalation	2,4-DNT	9.3E-06	2.2E-02
	Security worker	Soil (TNT ditch)	Ingestion, Inhalation		1.5E-09	1.9E-04
		Soil (open tank area)	Ingestion, Inhalation	2,4,6-TNT	1.4E-06	2.6E-01
		Sediment	Ingestion, Inhalation		1.7E-09	3.0E-05
Future	Maintenance worker	Soil (TNT ditch)	Ingestion, Inhalation		2.9E-07	3.5E-02
		Soil (open tank area)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, 1,3,5-TNB	2.7E-04	4.8E+01
		Sediment	Ingestion, Inhalation		3.2E-07	5.6E-03
	Construction worker	Soil (TNT ditch)	Ingestion, Inhalation		1.5E-07	7.3E-02
		Soil (TNT ditch hotspot)	Ingestion, Inhalation		2.5E-07	6.1E-01
		Soil (open tank area)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT	7.4E-05	1.6E+02
		Sediment	Ingestion, Inhalation		1.2E-07	3.2E-02
		Groundwater	Ingestion		3.8E-08	1.6E-03
	Industrial worker	Soil (TNT ditch)	Ingestion, Inhalation		1.9E-07	2.3E-02
		Soil (open tank area)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT	1.8E-04	3.2E+01
		Sediment	Ingestion, Inhalation		2.1E-07	3.7E-03
	Resident	Soil (TNT ditch)	Ingestion, Inhalation	2,6-DNT	1.7E-06	1.8E-01
		Soil (open tank area)	Ingestion, Inhalation	2,4,6-TNT, 2,4-DNT, RDX, 1,3,5-TNB	1.6E-03	2.4E+02
		Sediment	Ingestion, Inhalation	2,4-DNT	1.9E-06	2.8E-02
		Groundwater	Ingestion, Inhalation, Dermal	2,4-DNT, 2,6-DNT, PCE, RDX, 1,3-DNB	2.3E-04	1.2E+00
	Resident child	Surface water (small intermittent pond)	Dermal	2,4-DNT	3.5E-04	9.4E-01
M8						
Current	Maintenance worker	Soil	Ingestion, Inhalation	Lead	NC	9.3E-04
		Sediment (S acid ditch)	Ingestion, Inhalation	Chrysene, Benzo(b)fluoranthene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(k)fluoanthene	4.9E-06	1.0E-03
		Sediment (N acid ditch and acid ponds)	Ingestion, Inhalation		NC	2.2E-02
		Sediment (Jackson Creek tributaries)	Ingestion, Inhalation		NC	3.0E-04
		Surface water (South acid ditch)	Dermal		2.0E-08	1.1E-04
		Surface water (N acid ditch acid and pon	Dermal		4.5E-09	2.3E-05
		Surface water (Jackson Creek tributaries)	Dermal		NC	6.4E-07
	Security worker	Soil	Ingestion, Inhalation	Lead	NC	4.9E-06
		Sediment (S acid ditch)	Ingestion, Inhalation		2.6E-08	5.4E-06
		Sediment (N acid ditch and acid ponds)	Ingestion, Inhalation		NC	1.2E-04
	Hunter	Soil	Ingestion, Inhalation	Lead	NC	1.5E-04
		Sediment (S acid ditch)	Ingestion, Inhalation	Chrysene	9.4E-07	1.6E-04
		Sediment (N acid ditch and acid ponds)	Ingestion, Inhalation		NC	3.5E-03
		Sediment (Jackson Creek tributaries)	Ingestion, Inhalation		NC	4.8E-05
Future	Maintenance worker	Soil	Ingestion, Inhalation	Lead	NC	9.3E-04
		Sediment (S acid ditch)	Ingestion, Inhalation	Chrysene, Benzo(b)fluoranthene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(k)fluoranthene	4.9E-06	1.0E-03
		Sediment (N acid ditch and acid ponds)	Ingestion, Inhalation		NC	2.2E-02
		Sediment (Jackson Creek tributaries)	Ingestion, Inhalation		NC	3.0E-03
	Construction worker	Soil	Ingestion, Inhalation	Lead	NC	8.1E-03
		Sediment (S acid ditch)	Ingestion, Inhalation	Chrysene, Benzo(b)fluoranthene,Benzo(a)anthracene, Benzo(a)pyrene, Benzo(k)fluoranthene	2.3E-06	6.9E-03
		Sediment (N acid ditch and acid ponds)	Ingestion, Inhalation		NC	1.9E-01
		Sediment (Jackson Creek tributaries)	Ingestion, Inhalation		NC	2.6E-03
		Groundwater	Ingestion		NC	2.3E-05

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
M8						
Future	Industrial worker	Soil	Ingestion, Inhalation	Lead	NC	6.2E-04
		Sediment (S acid ditch)	Ingestion, Inhalation	Chrysene, Benzo(b)fluoranthene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(k)fluoranthene	3.3E-06	6.8E-04
		Sediment (N acid ditch and acid ponds)	Ingestion, Inhalation		NC	1.4E-02
	Resident	Soil	Ingestion, Inhalation	Lead	NC	4.6E-03
		Sediment (S acid ditch)	Ingestion, Inhalation	Chrysene, Benzo(b)fluoranthene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(k)fluoranthene	2.9E-05	5.1E-03
		Sediment (N acid ditch and acid ponds)	Ingestion, Inhalation		NC	1.1E-01
		Sediment (Jackson Creek tributaries)	Ingestion, Inhalation		NC	1.5E-03
		Groundwater	Ingestion, Inhalation, Dermal		NC	4.8E-02
	Resident child	Surface water (South acid ditch)	Dermal		3.4E-07	1.6E-03
		Surface water (N acid ditch acid and pon	Dermal		7.5E-08	8.0E-04
		Surface water (Jackson Creek tributaries)	Dermal		NC	8.9E-06
M9						
Current	Maintenance worker	Surface water	Dermal		NC	5.4E-06
Future	Resident child	Surface water	Dermal		NC	7.4E-05
	Exposure to soil and ash was considered for maintenance and security workers and residents but cancer slope factors and RfDs were not available for the contaminants of concern and therfore risks could not be calculated.					
M10						
Future	Construction worker	Groundwater (west farm)	Ingestion		1.2E-09	6.0E-04
		Groundwater (Ctr farm)	Ingestion		1.2E-10	7.5E-04
	Resident	Groundwater (west farm)	Ingestion, Inhalation, Dermal	Benzene, Toluene	1.8E-05	8.9E+00
		Groundwater (Ctr farm)	Ingestion, Inhalation, Dermal	Benzene, Toluene	1.8E-06	1.2E+01
M11						
Current	Maintenance worker	Sediment	Ingestion, Inhalation		4.3E-11	1.5E-04
	Security worker	Sediment	Ingestion, Inhalation		4.3E-12	1.5E-05
Future	Maintenance worker	Sediment	Ingestion, Inhalation		8.1E-10	2.9E-03
	Construction worker	Groundwater	Ingestion		NC	6.6E-05
		Sediment	Ingestion, Inhalation		7.1E-07	1.4E-01
	Resident	Groundwater	Ingestion, Inhalation, Dermal		NC	2.5E-02
		Sediment	Ingestion, Inhalation		1.5E-09	1.4E-02
	Resident child	Surface water	Dermal		NC	1.8E-03
M12						
Current	Maintenance worker	Soil	Ingestion, Inhalation		NC	1.1E-04
		Sediment	Ingestion, Inhalation	Lead	NC	9.2E-04
	Security worker	Soil	Ingestion, Inhalation		NC	1.1E-05
		Sediment	Ingestion, Inhalation	Lead	NC	9.2E-04
Future	Maintenance worker	Soil	Ingestion, Inhalation		NC	2.0E-03
		Sediment	Ingestion, Inhalation	Lead	NC	1.7E-02
	Construction worker	Soil	Ingestion, Inhalation		NC	8.2E-03
		Sediment	Ingestion, Inhalation	Lead	NC	2.6E-01
		Groundwater	Ingestion		NC	NC
	Industrial worker	Soil	Ingestion, Inhalation		NC	1.4E-03
		Sediment	Ingestion, Inhalation	Lead	NC	1.2E-02
	Resident	Soil	Ingestion, Inhalation		NC	1.0E-02
		Sediment	Ingestion, Inhalation	Lead	NC	8.5E-02
		Groundwater	Ingestion, Inhalation, Dermal		NC	NC
	Resident child	Surface water	Dermal		1.0E-07	1.0E-03
M13						
Future	Construction worker	Groundwater	Ingestion		NC	5.1E-05
	Resident	Groundwater	Ingestion, Inhalation, Dermal		NC	1.9E-02
M14						
Current	Maintenance worker	Soil	Ingestion, Inhalation		NC	1.6E-05
	Security worker	Soil	Ingestion, Inhalation		NC	1.6E-06
Future	Maintenance worker	Soil	Ingestion, Inhalation		NC	3.1E-04
	Construction worker	Soil	Ingestion, Inhalation		NC	1.4E-03

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
M14						
Future	Resident	Soil	Ingestion, Inhalation		NC	1.5E-03
M15						
Current	Maintenance worker	Soil	Ingestion, Inhalation	Chrysene	8.4E-09	7.9E-03
		Sediment (north ditch)	Ingestion, Inhalation		NC	1.0E-03
		Sediment (south ditch)	Ingestion, Inhalation	Beryllium	8.7E-06	5.7E-02
		Surface water (N ditch)	Dermal		2.2E-09	1.4E-05
		Surface water (S ditch)	Dermal		3.1E-09	1.1E-05
	Security worker	Soil	Ingestion, Inhalation		1.1E-08	4.2E-05
		Sediment (north ditch)	Ingestion, Inhalation		NC	5.5E-06
		Sediment (south ditch)	Ingestion, Inhalation		4.6E-08	3.0E-04
Future	Maintenance worker	Soil	Ingestion, Inhalation	Chrysene	8.4E-09	7.9E-03
		Sediment (north ditch)	Ingestion, Inhalation		NC	1.0E-03
		Sediment (south ditch)	Ingestion, Inhalation	Beryllium	8.7E-06	5.7E-02
	Construction worker	Soil	Ingestion, Inhalation	Chrysene	9.8E-07	6.7E-02
		Sediment (north ditch)	Ingestion, Inhalation		NC	7.8E-03
		Sediment (south ditch)	Ingestion, Inhalation	Beryllium	5.0E-06	5.6E-01
	Industrial worker	Soil	Ingestion, Inhalation	Chrysene	6.0E-09	5.3E-05
		Sediment (north ditch)	Ingestion, Inhalation		NC	6.9E-04
		Sediment (south ditch)	Ingestion, Inhalation	Beryllium	5.8E-06	3.8E-02
	Resident	Soil	Ingestion, Inhalation	Chrysene	5.0E-08	3.9E-02
		Sediment (north ditch)	Ingestion, Inhalation		NC	5.1E-03
		Sediment (south ditch)	Ingestion, Inhalation	Beryllium	5.2E-05	2.8E-01
	Resident child	Surface water (N ditch)	Dermal		8.5E-08	3.3E-04
		Surface water (S ditch)	Dermal		1.2E-07	3.2E-04
Jackson Creek (MFG area)						
Current	Fish consumer	Surface water	Ingestion	Arsenic	6.1E-05	3.2E-01
Future	Fisherman	Surface water	Dermal		1.5E-07	4.1E-03
	Resident child	Surface water	Dermal		5.3E-07	3.3E-03
Grant Creek (MFG area)						
Current	Fish consumer	Surface water	Ingestion	2,6-DNT,2,4-DNT	6.6E-06	3.6E-02
Future	Fisherman	Surface water	Dermal	2,4,6-TNT	7.9E-06	1.8E-03
	Resident child	Surface water	Dermal	2,4,6-TNT	8.3E-06	8.0E-04
L1						
Current	Security worker	Soil	Inhalation, ingestion, dermal		1.0E-07	4.0E-02
Future	Industrial worker	Soil	Inhalation, ingestion, dermal	2,4,6-TNT, Cadmium	1.0E-05	7.0E+00
	Construction worker	Soil	Inhalation, ingestion, dermal	PCB 1260, 2,4,6-TNT	1.0E-05	8.0E+00
	Resident	Soil	Inhalation, ingestion, dermal	2,4,6-TNT, Cadmium	1.0E-04	2.0E+01
	Hunter	Soil	Inhalation, ingestion, dermal	2,4,6-TNT, Cadmium	4.0E-06	1.0E+00
	Resident	Groundwater	Inhalation, ingestion, dermal	2,4,6-TNT, 1,3,5-TNB	4.0E-04	4.0E+02
L2						
Current	Security worker	Soil (burning pad)	Inhalation, ingestion, dermal		2.0E-07	2.0E-02
		Soil (popping furnace)	Inhalation, ingestion, dermal		2.0E-07	1.0E-03
		Soil (oils pits)	Inhalation, ingestion, dermal	PCBs	3.0E-04	4.0E-02
	Hunter	Soil (burning pad)	Inhalation, ingestion, dermal	2,4,6-TNT	6.0E-06	6.0E-01
		Soil (popping furnace)	Inhalation, ingestion, dermal		6.0E-06	3.0E-02
		Soil (oils pits)	Inhalation, ingestion, dermal	PCBs	1.0E-02	1.0E+00
Future	Industrial worker	Soil (burning pad)	Inhalation, ingestion, dermal	2,4,6-TNT	2.0E-05	3.0E+00
		Soil (popping furnace)	Inhalation, ingestion, dermal		2.0E-05	7.0E-01
		Soil (oils pits)	Inhalation, ingestion, dermal	PCBs, Heptachlor epoxide	6.0E-02	5.0E+00
	Construction worker	Soil (burning pad)	Inhalation, ingestion, dermal	2,4,6-TNT	2.0E-05	6.0E+00
		Soil (popping furnace)	Inhalation, ingestion, dermal	Cadmium	4.0E-05	1.0E-01
		Soil (oils pits)	Inhalation, ingestion, dermal	PCBs, Heptachlor epoxide	2.0E-03	2.0E+01
	Resident	Soil (burning pad)	Inhalation, ingestion, dermal	2,4,6-TNT	2.0E-04	2.0E+01
		Soil (popping furnace)	Inhalation, ingestion, dermal		2.0E-04	1.0E+00
		Soil (oils pits)	Inhalation, ingestion, dermal	PCBs, Heptachlor epoxide	2.0E-01	3.0E+01
	Resident	Groundwater (burning pad)	Inhalation, ingestion, dermal	RDX	8.0E-04	6.0E+00
		Groundwater (oil pits)	Inhalation, ingestion, dermal	1,2-Dichloroethane	5.0E-06	6.0E-02
	Resident (child)	Surface water	Dermal	PCBs	3.0E-02	7.0E-02

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
L3						
Current	Security worker	Soil	Inhalation, ingestion, dermal		1.0E-07	3.0E-03
		Soil (northeast area)	Inhalation, ingestion, dermal		8.0E-08	5.0E-03
		Soil (bermed area)	Inhalation, ingestion, dermal		3.0E-07	7.0E-03
Future	Industrial worker	Soil	Inhalation, ingestion, dermal	Arsenic, RDX	2.0E-05	5.0E-01
		Soil (northeast area)	Inhalation, ingestion, dermal	Arsenic, 2,6-DNT	9.0E-06	8.0E-01
		Soil (bermed area)	Inhalation, ingestion, dermal	RDX	4.0E-05	1.0E+00
	Construction worker	Soil	Inhalation, ingestion, dermal	Arsenic, RDX	2.0E-05	1.0E+00
	Resident	Soil	Inhalation, ingestion, dermal	Arsenic, RDX	1.0E-04	3.0E+00
		Soil (northeast area)	Inhalation, ingestion, dermal	Arsenic, 2,6,-DNT, Thallium, 1,3,5-TNB	8.0E-05	5.0E+00
		Soil (bermed area)	Inhalation, ingestion, dermal	RDX	3.0E-04	6.0E+00
	Hunter	Soil	Inhalation, ingestion, dermal	Arsenic, RDX	5.0E-06	1.0E-01
		Soil (northeast area)	Inhalation, ingestion, dermal	Arsenic, 2,6-DNT	3.0E-06	2.0E-01
		Soil (bermed area)	Inhalation, ingestion, dermal	RDX	1.0E-05	2.0E-01
	Resident	Groundwater (bermed area)	Inhalation, ingestion, dermal	RDX	1.0E-04	8.0E-01
		Groundwater (burn cage plume)	Inhalation, ingestion, dermal	RDX	3.0E-05	2.0E-01
L4						
Current	Security worker	Soil	Inhalation, ingestion, dermal		2.0E-08	4.0E-04
Future	Industrial worker	Soil	Inhalation, ingestion, dermal	PAHs, PCB 1260	3.0E-06	8.0E-02
	Construction worker	Soil	Inhalation, ingestion, dermal		2.0E-06	2.0E-01
	Resident	Soil	Inhalation, ingestion, dermal	PAHs, PCB 1260	2.0E-05	2.0E-01
	Hunter	Soil	Inhalation, ingestion, dermal		7.0E-07	1.0E-02
	Resident	Groundwater	Inhalation, ingestion, dermal	1,2-Dichlorethane	2.0E-05	1.0E-04
L5						
Current	Security worker	Soil	Inhalation, ingestion, dermal	PCBs	7.0E-04	1.0E-02
		Soil (junk pile)	Inhalation, ingestion, dermal	PCBs	1.0E-03	3.0E-02
Future	Industrial worker	Soil	Inhalation, ingestion, dermal	PCBs,Cadmium	1.0E-01	3.0E+00
		Soil (junk pile)	Inhalation, ingestion, dermal	PCBs.Cadmium	3.0E-01	6.0E+00
	Construction worker	Soil	Inhalation, ingestion, dermal	PCBs	8.0E-03	2.0E+00
	Resident	Soil	Inhalation, ingestion, dermal	PCBs,Cadmium	3.0E-01	7.0E+00
		Soil (junk pile)	Inhalation, ingestion, dermal	PCBs,Cadmium	6.0E-01	1.0E+01
	Hunter	Soil	Inhalation, ingestion, dermal	PCBs	2.0E-02	4.0E-01
		Soil (junk pile)	Inhalation, ingestion, dermal	PCBs	5.0E-02	9.0E-01
	Resident	Grounwater	Inhalation, ingestion, dermal	Manganese	NC	3.0E+00
L6						
Current	Security worker	Soil	Inhalation, ingestion, dermal		2.0E-06	2.0E-04
		Soil (PCB spill area)	Inhalation, ingestion, dermal		2.0E-06	3.0E-04
	Industrial worker	Soil	Inhalation, ingestion, dermal	PCBs, PAHs	3.0E-04	2.0E-02
		Soil (PCB spill area)	Inhalation, ingestion, dermal	PCBs, PAHs	4.0E-04	3.0E-02
	Construction worker	Soil	Inhalation, ingestion, dermal	PAHs, PCBs	9.0E-05	2.0E-01
	Resident	Soil	Inhalation, ingestion, dermal	PCBs, PAHs	1.0E-03	1.0E-01
		Soil (PCB spill area)	Inhalation, ingestion, dermal	PCBs, PAHs	2.0E-03	2.0E-01
	Hunter	Soil	Inhalation, ingestion, dermal	PCBs, PAHs	6.0E-05	5.0E-03
		Soil (PCB spill area)	Inhalation, ingestion, dermal	PCBs, PAHs	7.0E-05	8.0E-03
	Resident	Groundwater	Inhalation, ingestion, dermal	Arsenic	3.0E-04	1.0E+00
	Resident (child)	Surface water	Dermal		6.0E-09	8.0E-05
L7						
Current	Security worker	Soil	Inhalation, ingestion, dermal	PCBs	4.0E-06	3.0E-05
	Construction worker	Soil	Inhalation, ingestion, dermal	PCBs	8.0E-05	3.0E-02
	Resident	Soil	Inhalation, ingestion, dermal	PCBs	2.0E-03	3.0E-02
	Hunter	Soil	Inhalation, ingestion, dermal	PCBs	1.0E-04	8.0E-04
	Resident	Groundwater	Inhalation, ingestion, dermal		NC	1.0E-02
	Resident (child)	Surface water	Dermal		1.0E-07	3.0E-02
L8						
Current	Security worker	Soil	Inhalation, ingestion, dermal		4.0E-07	4.0E-05
Future	Industrial worker	Soil	Inhalation, ingestion, dermal	PCBs	1.0E-04	5.0E-03
	Construction worker	Soil	Inhalation, ingestion, dermal	PCBs	1.0E-05	1.0E-02
	Resident	Soil	Inhalation, ingestion, dermal	PCBs	2.0E-04	4.0E-02

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
L8						
Future	Hunter	Soil	Inhalation, ingestion, dermal	PCBs	2.0E-05	1.0E-03
	Resident	Groundwater	Inhalation, ingestion, dermal		NC	2.0E+00
	Resident (child)	Surface water	Dermal		7.0E-08	3.0E-02
L9						
Current	Security worker	Soil	Inhalation, ingestion		6.0E-07	8.0E-02
		Soil (building 3-4)	Inhalation, ingestion	RDX	1.0E-06	5.0E-02
		Soil (building 3-5A)	Inhalation, ingestion	2,4,6-TNT	1.0E-06	3.0E-01
Future	Industrial Worker	Soil	Inhalation, ingestion	2,4,6-TNT, RDX	8.0E-05	9.0E+00
		Soil (building 3-4)	Inhalation, ingestion	2,4,6-TNT, RDX	2.0E-04	6.0E+00
		Soil (building 3-5A)	Inhalation, ingestion	2,4,6-TNT	2.0E-04	3.0E+01
	Construction worker	Soil	Inhalation, ingestion	2,4,6-TNT, RDX	2.0E-05	4.0E+01
	Resident	Soil	Inhalation, ingestion	2,4,6-TNT, RDX	7.0E-04	7.0E+01
		Soil (building 3-4)	Inhalation, ingestion	RDX, 2,4,6-TNT	2.0E-03	5.0E+01
		Soil (building 3-5A)	Inhalation, ingestion	2,4,6-TNT	2.0E-03	2.0E+02
	Hunter	Soil	Inhalation, ingestion	2,4,6-TNT, RDX	2.0E-05	2.0E+00
		Soil (building 3-4)	Inhalation, ingestion	2,4,6-TNT, RDX	5.0E-05	1.0E+00
		Soil (building 3-5A)	Inhalation, ingestion	2,4,6-TNT	5.0E-05	8.0E+00
	Resident (child)	Surface water	Dermal		3.0E-07	1.0E-01
	Hunter	Sediment	Inhalation, ingestion		2.0E-08	3.0E-03
L10						
Current	Security worker	Soil	Inhalation, ingestion, dermal	PCBs, RDX	1.0E-05	2.0E-02
		Soil (Hotspot)	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	4.0E-06	1.0E-01
	Industrial worker	Soil	Inhalation, ingestion, dermal	PCBs, RDX, 2,4,6-TNT	2.0E-03	2.0E+00
		Soil (Hotspot)	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	5.0E-04	1.0E+01
Furture	Construction worker	Soil	Inhalation, ingestion, dermal	PCBs, RDX, 2,4,6-TNT	2.0E-04	5.0E+00
	Resident	Soil	Inhalation, ingestion, dermal	PCBs, RDX, 2,4,6-TNT	6.0E-03	1.0E+01
		Soil (Hotspot)	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	5.0E-03	1.0E+02
		Groundwater	Inhalation, ingestion, dermal	1,2-Dichloroethane, RDX, Manganese	1.0E-05	9.0E+00
	Hunter	Soil	Inhalation, ingestion, dermal	PCBs, RDX	3.0E-04	5.0E-01
		Soil (Hotspot)	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	2.0E-04	4.0E+00
	Resident (child)	Surface water	Dermal		2.0E-07	7.0E-03
L11						
Current	Security worker	Soil	Inhalation, ingestion, dermal		7.0E-08	9.0E-04
Future	Industrial worker	Soil	Inhalation, ingestion, dermal	Arsenic	9.0E-06	2.0E-01
	Construction worker	Soil	Inhalation, ingestion, dermal	Arsenic	1.0E-05	4.0E-01
	Resident	Soil	Inhalation, ingestion, dermal	Arsenic	8.0E-05	5.0E-01
	Hunter	Soil	Inhalation, ingestion, dermal	Arsenic	2.0E-06	3.0E-02
L13						
Current	Security worker	Soil	Inhalation, ingestion		7.0E-10	1.0E-05
Future	Industrial worker	Soil	Inhalation, ingestion		8.0E-08	1.0E-03
	Construction worker	Soil	Inhalation, ingestion		3.0E-08	6.0E-03
	Resident	Soil	Inhalation, ingestion		7.0E-07	9.0E-03
	Hunter	Soil	Inhalation, ingestion		2.0E-08	3.0E-04
L14						
Current	Security worker	Soil	Inhalation, ingestion, dermal	RDX	1.0E-06	4.0E-02
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX	7.0E-06	2.0E-01
Future	Industrial worker	Soil	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	1.0E-04	5.0E+00
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	9.0E-04	3.0E+01
	Construction worker	Soil	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	4.0E-05	2.0E+01
	Resident	Soil	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	1.0E-03	3.0E+01
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	8.0E-03	2.0E+02
	Hunter	Soil	Inhalation, ingestion, dermal	RDX,2,4,6-TNT	4.0E-05	1.0E+00
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX, 2,4,6-TNT	3.0E-04	7.0E+00
	Resident	Groundwater	Inhalation, ingestion, dermal	RDX	1.0E-03	8.0E+00
	Resident (child)	Surface water	Dermal		2.0E-08	4.0E-03
L15						
Current	Security worker	Soil	Inhalation, ingestion		4.0E-10	4.0E-05
Future	Industrial worker	Soil	Inhalation, ingestion		5.0E-08	5.0E-03

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
L15						
Future	Construction worker	Soil	Inhalation, ingestion		2.0E-08	2.0E-02
	Resident	Soil	Inhalation, ingestion		4.0E-07	4.0E-02
	Hunter	Soil	Inhalation, ingestion		1.0E-08	1.0E-03
L16						
Current	Security worker	Soil	Inhalation, ingestion, dermal	RDX	2.0E-06	2.0E-02
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX	1.0E-05	9.0E-02
	Industrial worker	Soil	Inhalation, ingestion, dermal	RDX	3.0E-04	3.0E+00
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX	1.0E-03	1.0E+01
Future	Construction worker	Soil	Inhalation, ingestion, dermal	RDX	9.0E-05	1.0E+01
	Resident	Soil	Inhalation, ingestion, dermal	RDX	3.0E-03	2.0E+01
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX	1.0E-02	8.0E+01
	Hunter	Soil	Inhalation, ingestion, dermal	RDX	8.0E-05	6.0E-01
		Soil (hotspots)	Inhalation, ingestion, dermal	RDX	4.0E-04	3.0E+00
	Resident (child)	Surface water	Dermal		4.0E-08	1.0E-03
L17						
Current	Security worker	Soil	Inhalation, ingestion, dermal	PCBs	5.0E-06	7.0E-05
		Soil (hotspots)	Inhalation, ingestion, dermal	PCBs	7.0E-05	4.0E-04
	Industrial worker	Soil	Inhalation, ingestion, dermal	PCBs	1.0E-03	2.0E-02
		Soil (hotspots)	Inhalation, ingestion, dermal	PCBs	2.0E-02	9.0E-02
Future	Construction worker	Soil	Inhalation, ingestion, dermal	PCBs	3.0E-04	3.0E-02
	Resident	Soil	Inhalation, ingestion, dermal	PCBs	3.0E-03	3.0E-02
		Soil (hotspots)	Inhalation, ingestion, dermal	PCBs	4.0E-02	1.0E-01
	Hunter	Soil	Inhalation, ingestion, dermal	PCBs	2.0E-04	2.0E-03
		Soil (hotspots)	Inhalation, ingestion, dermal	PCBs	3.0E-03	1.0E-02
	Resident (child)	Surface water	Dermal		NC	4.0E-04
L18 & L19						
Future	Resident	Groundwater	Inhalation, ingestion, dermal	Manganese	NC	3.0E+00
L23						
Current	Security worker	Soil	Inhalation, ingestion		4.0E-10	4.0E-03
Future	Industrial worker	Soil	Inhalation, ingestion		9.0E-08	7.0E-01
	Construction worker	Soil	Inhalation, ingestion	Cadmium, Nickel, Manganese, Antimony	5.0E-06	9.0E+00
	Resident	Soil	Inhalation, ingestion	Antimony	3.0E-07	3.0E+00
	Hunter	Soil	Inhalation, ingestion		2.0E-08	1.0E-01
L32						
Current	Security worker	Soil	Inhalation, ingestion		NC	2.0E-06
Future	Industrial worker	Soil	Inhalation, ingestion		NC	2.0E-04
	Construction worker	Soil	Inhalation, ingestion		NC	1.0E-03
	Resident	Soil	Inhalation, ingestion		NC	1.0E-03
	Hunter	Soil	Inhalation, ingestion		NC	5.0E-05
L33						
Current	Security worker	Soil	Inhalation, ingestion		2.0E-10	9.0E-06
Future	Industrial worker	Soil	Inhalation, ingestion		2.0E-08	1.0E-03
	Construction worker	Soil	Inhalation, ingestion		1.0E-08	7.0E-03
	Resident	Soil	Inhalation, ingestion		2.0E-07	9.0E-03
	Hunter	Soil	Inhalation, ingestion		6.0E-09	3.0E-04
L34						
Current	Security worker	Soil	Inhalation, ingestion		NC	2.0E-06
Future	Industrial worker	Soil	Inhalation, ingestion		NC	2.0E-04
	Construction worker	Soil	Inhalation, ingestion		NC	2.0E-03
	Resident	Soil	Inhalation, ingestion		NC	2.0E-03
	Hunter	Soil	Inhalation, ingestion		NC	6.0E-05
Jordan Creek (LAP area)						
Current	Fishermen	Surface water	Ingestion, dermal		2.0E-07	8.0E-02
	Fish consumer	Surface water	Ingestion		5.0E-07	1.0E-01
Future	Resident child	Surface water	Ingestion, dermal		9.0E-08	1.0E-01
Prairie Creek (LAP area)						
Current	Fishermen	Surface water	Ingestion, dermal		6.0E-08	7.0E-01
	Fish consumer	Surface water	Ingestion	1,3,5-TNB	2.0E-07	2.0E+00

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-2
SUMMARY OF REASONABLE MAXIMUM EXPOSURE RISK CHARACTERIZATION
JOAAP, WILL COUNTY, ILLINOIS

Land Use	Receptor	Media	Pathway	Major Chemicals Contributing to Exceedences	Total Carcinogenic Risk	Hazard Index
Prairie Creek (LAP area)						
Future	Resident child	Surface water	Ingestion, dermal		2.0E-08	9.0E-01
Kemery Lake (LAP area)						
Current	Fishermen	Surface water	Ingestion, dermal	Beryllium, Arsenic	2.0E-05	6.0E-01
	Fish consumer	Surface water	Ingestion	Beryllium, Arsenic	3.0E-04	2.0E+00
Future	Resident child	Surface water	Ingestion, dermal	Beryllium, Arsenic	6.0E-06	8.0E-01

NC- Not caculated as the cancer slope factors and/or RfDs are not available.
Shaded values exceed acceptable risks levels.
Source: DAMO23, DAMO26.

TABLE 4-3
INVENTORY OF UNDERGROUND STORAGE TANKS
JOAAP, WILL COUNTY, ILLINOIS

USCOE UST Survey Tank Number (JAAP-)	Facility Tank Identification Number	Year Installed	Capacity (gallons)	Location (PAS Section)	Substance Stored	Construction Material		Removal Date
						Tank	Piping	
1	1-1-1	1941	20,000	L7	Fuel oil	Steel	Bare steel	September, 1991[1]
2	1-1-2	1942	20,000	L7	Fuel oil	Steel	Bare steel	September, 1991[1]
3	2-1-1	1941	20,000	L8	Fuel oil	Steel	Bare steel	October, 1991[1]
4	2-1-2	1942	20,000	L8	Fuel oil	Steel	Bare steel	October, 1991[1]
5	2-1-3	1941	260	L8	Diesel	Steel	Bare steel	October, 1991[1]
6	3-1-1	1941	20,000	L9	Fuel oil	Steel	Bare steel	November, 1991[1]
7	3-1-2	1942	20,000	L9	Fuel oil	Steel	Bare steel	November, 1991[1]
8	3-1-3	1954	20,000	L9	Fuel oil	Steel	Bare steel	November, 1991[1]
9	3-1-4	1954	20,000	L9	Fuel oil	Steel	Bare steel	November, 1991[1]
10	3A-1-1	1942	20,000	L10	Fuel oil	Steel	Bare steel	October, 1991[1]
11	3A-1-2	1943	20,000	L10	Fuel oil	Steel	Bare steel	October, 1991[1]
12	20-19-1	1984	4,000	L20	Diesel	Fiberglass	Bare steel	September, 1993[2]
13	23-35-1	1952	8,000	L2	Fuel oil	Steel	Bare steel	August, 1991[1]
14	23-39-1	1979	250	L3	Fuel oil	Steel	Bare steel	August, 1991[1]
15	23-40-1	1976	2,000	L2	Fuel oil	Steel	Bare steel	September, 1993[2]
16	26-7-1	1952	10,000	L5	Waste oil	Steel	Bare steel	December, 1990[4]
17	60-11-2	1943	280	L32	Diesel	Steel	Bare steel	September, 1991[1]
18	70-16-1	1966?	1,500	L6	Gasoline	Steel	Bare steel	March, 1994[12]
19	308-1-3-1	1941	1,000	M8	Diesel	Steel	Bare steel	September, 1991[1]
20	401-1-1	1941	15,000	M8	Fuel oil	Steel	Bare steel	September, 1991[1]
21	401-2-1	1941	15,000	M8	Fuel oil	Steel	Bare steel	September, 1991[1]
22	505-12-2	1984	560	M105	Diesel	Steel	Bare steel	
23	601-96-1	1964	7,500	M5	Acetone	Steel	Bare steel	December, 1990[4]
24	601-96-2	1964	7,500	M5	Acetone	Steel	Bare steel	December, 1990[4]
25	716-1-2	1968	8,000	M18	Diesel	Steel	Bare steel	September, 1991[1]
26	716-1-3	1969	3,000	M18	Fuel oil	Steel	Bare steel	September, 1991[1]
27	718-1-1	1943	10,000	M104	Diesel	Steel	Bare steel	Removed[5]

TABLE 4-3
INVENTORY OF UNDERGROUND STORAGE TANKS
JOAAP, WILL COUNTY, ILLINOIS

USCOE UST Survey Tank Number (JAAP-)	Facility Tank Identification Number	Year Installed	Capacity (gallons)	Location (PAS Section)	Substance Stored	Construction Material		Removal Date
						Tank	Piping	
28	718-2-1	1943	8,000	M108	Diesel	Steel	Bare steel	December, 1990[4]
29	718-2-2	1943	8,000	M108	Diesel	Steel	Bare steel	December, 1990[4]
30	861-1	1966	16,000	M7	Fuel oil	Steel	Bare steel	August, 1991[1]
31	861-2	1966	16,000	M7	Fuel oil	Steel	Bare steel	August, 1991[1]
32	861-3	1966	16,000	M7	Fuel oil	Steel	Bare steel	August, 1991[1]
33	861-4	1966	26,000	M7	Fuel oil	Steel	Bare steel	August, 1991[1]
34	861-5	1966	21,000	M7	Fuel oil	Steel	Bare steel	August, 1991[1]
35	861-6	1966	21,000	M7	Fuel oil	Steel	Bare steel	August, 1991[1]
36	861-7	1966	21,000	M7	Fuel oil	Steel	Bare steel	August, 1991[1]
37	1181-1	1972	8,000	Shop	Gasoline	Steel	Bare steel	Removed[5]
38	1181-2	1972	8,000	Shop	Gasoline	Steel	Bare steel	Removed[5]
39	TNT 3-1-1	1943	1,000	M6	Sulfuric Acid	Steel	Bare steel	September, 1993[2]
40	TNT 6 A&B-1	1943	1,000	M6	Sulfuric Acid	Steel	Bare steel	September, 1993[2]
41	23-2	1942	2,000	L21	Fuel oil	Steel	Bare steel	
42	23-34	1941	565	L21	Fuel oil	Steel	Bare steel	August, 1991[1]
43	60-7-1	1941	1,000	L32	Fuel oil	Steel	Bare steel	September, 1991[1]
44	60-11-1	1941	17,000	L32	Fuel oil	Steel	Bare steel	September, 1991[1]
45	61-11	1941	4,000	L21	Fuel oil	Steel	Bare steel	September, 1993[2]
46	64-36	1978	2,000	L118	Fuel oil	Unknown	Unknown	September, 1993[2]
47	70-43-1	1941	20,000	L6	Fuel oil	Steel	Bare steel	August, 1991[1]
48	70-43-2	1941	20,000	L6	Fuel oil	Steel	Bare steel	August, 1991[1]
49	70-43-3	1941	20,000	L6	Fuel oil	Steel	Bare steel	August, 1991[1]
50	412-1	1941	1,000	M115	Fuel oil	Steel	Bare steel	August, 1991[1]
51	412-2	1941	1,000	M115	Fuel oil	Steel	Bare steel	August, 1991[1]
52	505-12-1	1984	3,000	M15	Fuel oil	Unknown	Unknown	
53	707-13	1941	1,000	M108	Fuel oil	Unknown	Bare steel	September, 1991[1]
54	709-1	1942	750	M103	Fuel oil	Steel	Bare steel	March, 1994[1]

TABLE 4-3
INVENTORY OF UNDERGROUND STORAGE TANKS
JOAAP, WILL COUNTY, ILLINOIS

USCOE UST Survey Tank Number (JAAP-)	Facility Tank Identification Number	Year Installed	Capacity (gallons)	Location (PAS Section)	Substance Stored	Construction Material		Removal Date
						Tank	Piping	
55	716-1-1	1941	8,000	M18	Fuel oil	Steel	Bare steel	September, 1991[1]
56	716-2-1	unknown	unknown	M16	Waste oil	Steel	Bare steel	Not found[18]
57	716-3	unknown	unknown	M16	Gasoline	Steel	Bare steel	Not found[18]
58	308-2-3-1	1941	1,000	M8	Fuel oil	Steel	Bare steel	September, 1991[1]
59	6-10-1	1942	15,000	L16	Fuel oil	Steel	Bare steel	August, 1991[1]
60	6-10-2	1942	15,000	L112	Fuel oil	Steel	Bare steel	August, 1991[1]
61	5-7-1	1941	15,000	L15	Fuel oil	Steel	Bare steel	September, 1993[2]
62	4-7-1	1942	15,000	L14	Fuel oil	Steel	Bare steel	September, 1993[2]
63	4-7-2	1941	unknown	L14	Diesel	Steel	Bare steel	
64	7-10-1	1942	15,000	L17	Fuel oil	Steel	Bare steel	September, 1993[2]
65	8-12-1	1942	15,000	L18	Fuel oil	Steel	Bare steel	August, 1991[1]
66	8-11-1	1941	unknown	L18	Fuel oil	Steel	Bare steel	August, 1991[1]
67	9-16-1	1941	20,000	L19	Fuel oil	Steel	Bare steel	August, 1991[1]
68	4-21-1	1941	20,000	L14	Fuel oil	Steel	Bare steel	March, 1994[14]
69	3A-1-3	1941	2,500	L10	Diesel	Steel	Bare steel	October, 1991[1]
70	100-1	1941	3,000	M104[17]	Fuel oil	Steel	Bare steel	March, 1994[15]
71	716-3-2		4,000	M16	Waste oil			March, 1994[18]
72	716-3-3		1,500	M16	Waste oil	Concrete		March, 1994[8]
73	70-13-1		6,000	L6	Waste oil			
74	70-13-2		1,500	L6	Waste Oil	Steel		March, 1994[9]
75	718-2-3		1,000	M108	Fuel Oil	Steel		March, 1994[10]
76	1101-1		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[3]
77	1101-2		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[3]
78	1101-3		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[3]
79	1101-4		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[3]
80	1101-5		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[3]
81	1101-6		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[3]

TABLE 4-3
INVENTORY OF UNDERGROUND STORAGE TANKS
JOAAP, WILL COUNTY, ILLINOIS

USCOE UST Survey Tank Number (JAAP-)	Facility Tank Identification Number	Year Installed	Capacity (gallons)	Location (PAS Section)	Substance Stored	Construction Material		Removal Date
						Tank	Piping	
82	1101-7		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[9]
83	1101-8		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[9]
84	1101-9		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[9]
85	1101-10		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[9]
86	1101-11		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[9]
87	1101-12		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[9]
88	1101-13		1,000	M102	Fuel oil	Steel	Galvanized steel	December, 1993[9]
89	721-4-1		2,000	M102	Fuel oil	Steel		December, 1994[11]
90	803-1-1			M6				
91	803-2-1			M6				
92	803-3-1			M6				
93	803-4-1			M6				
94	803-5-1			M6				
95	803-6-1			M6				
96	803-7-1			M6				
97	803-8-1			M6				
98	803-9-1			M6				
99	803-10-1			M6				
100	OL-1			M102				Removed[16]
101	713-1-1			M8	Gasoline			Not found[18]
102	713-1-2			M8	Gasoline			Not found[18]
103	722-4-1		1,300	M6	Sodium Sulfate	Steel		March, 1994[13]
104	722-4-2		2,500	M6	Sodium Sulfate	Steel		March, 1994[13]
105	1101-14		1,000	M102	Fuel Oil			
106	7-10-2		15,000	M17	Fuel Oil			

TABLE 4-3
INVENTORY OF UNDERGROUND STORAGE TANKS
JOAAP, WILL COUNTY, ILLINOIS

USCOE UST Survey Tank Number (JAAP-)	Facility Tank Identification Number	Year Installed	Capacity (gallons)	Location (PAS Section)	Substance Stored	Construction Material		Removal Date
						Tank	Piping	
107	70-5-1			L6	Fuel oil			June, 1993[16]
	70-10-2		200	L6				September, 1993[6]
	70-10-1		15,000	L6				September, 1993[6]
	24-1-1[16]			L116				

Source: ACOE02, AEST01, JAAP01, ACOE04, UCCI69

Note: Empty cells in the table indicate ithat the information was not available at the time of this report. Some tanks were in poor condition at the time of removal. Refer to the tank removal reports for remedial actions taken.

Shaded rows represent tanks in the Agriculture parcel.

1 BEST02
2 BEST01
3 ATEC13
4 BRAN01
5 UCCI56
6 DOTA10
7 ATEC02
8 ATEC03
9 ATEC04
10 ATEC05
11 ATEC06
12 ATEC07
13 ATEC08
14 ATEC09
15 ATEC10
16 FIEL01
17 Tank JAAP-70 is located west of building 709 about 25 feet west of the road, along a fence line (ACOE02).
18 MEMO22

TABLE 4-4
SUMMARY OF AST FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
L12		Doyle Lake Area				
L13		Group 68				
L20		Group 20				
	20-15	Effluent Pumping Station	R			Two 250-gallon AST were removed outside the building.
L21		Group 23	P	041:21:46.8	088:04:53.5	Generator with fuel tank adjacent to Pole 63.
	23-1	Surface Storage Reservoir	P			A tank with about 30 gallons of gasoline is attached to the side of the building. A large propane tank is on a concrete slab adjacent to the building. This building was locked.
	61-11	Power House for Crushing Plant	P	041:22:06.9	088:05:09.8	There is a pressure (vessel 3'diameter by 10') outside the building. NFPA symbol indicates that water is not to be used.
L22		Group 25				
L23		Group 27				
L24		Group 29				
L25		Group 62		041:22:20.5	088:05:08.2	Observed 500 gallon empty gasoline tank between 62-12 and 62-15.
			P	041:21:11.8	088:05:50.8	Two 250 gallon fuel tanks, both are empty. (AST both)
			P	041:21:05.1	088:05:29.1	One 250 gallon AST located between 62-3 and 62-2; which is empty.
			P			Three 250 gallon ASTs were observed in the warehouse area. No evidence of spills or stained soil was observed, nor were stains or stressed vegetation.
L26		Group 63				
L27		Group 64				
L28		Group 65				
L29		Group 66				
L30		Group 66A				
L31		Extraction Pits	P	041:21:07.5	088:07:38.8	500 gallon fuel tank, appears to be empty, according to lessee never used on-site and is owned by him.
L35		Fill Area				
L100		PAS Survey Section 100	P	041:21:52.0	088:07:49.6	Abandoned gasoline AST on its side within cow pasture. Art Holz reports it was abandoned by a lessee.
			P	041:21:51.9	088:07:13.0	There is a 300-gallon tank in a collapsed building.
L101		PAS Survey Section 101				
L102		PAS Survey Section 102				
L103		PAS Survey Section L103				
L104		PAS Survey Section 104				
L105		PAS Survey Section 105				
L106		PAS Survey Section 106				
L107		PAS Survey Section 107				
L108		PAS Survey Section 108				
	71-9	Commercial Truck Inspection Of	R	041:22:46.2	088:04:11.7	A fuel oil AST probably supplied the oil furnace in this building. No tank is currently present.
L109		PAS Survey Section 109				
L110		PAS Survey Section 110				
L111		PAS Survey Section 111				
L112		PAS Survey Section 112				
L113		PAS Survey Section 113				
L116		PAS Survey Section 116				

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-4
SUMMARY OF AST FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
	24-1A	Air Siren Building	P			The building contains large tank (possibly water) and two apparently empty oxygen tanks. There is a 3,000-gallon AST with a strong petroleum odor around it, about 60 feet west of building set, that has FLAMMABLE label and appears to be empty.
	62-25A	Superintendent's Office (North	P			There was one empty 500-gallon tank behind the building.
L117		PAS Survey Section 117				
L118		PAS Survey Section 118				
	64-36	Change House	P			A 1000-gallon potable water tank is currently located 80 feet north of building. An oil stain is located beneath a generator associated with the tank. A crushed and empty 500-gallon tank is located on the south walkway.
	65-35	Guard House	P	041:21:01.4	088:02:46.0	There is a 250 gasoline AST, 80 feet north of the building.
L119		PAS Survey Section 119	P	041:21:02.2	088:01:58.2	500 gallon petroleum tank disposed of on side of road leading to Gate 24.
L120		PAS Survey Section 120				
L121		PAS Survey Section 121				
	65-36	Change House	P	041:21:02.5	088:02:45.7	There is a 500-gallon tank (possibly containing oil) adjacent to the building.
M100		PAS Survey Section 100				
M101		PAS Survey Section				
M102		PAS Survey Section 102	P	041:24:41.4	088:08:06.6	E 58979 - 250 gallon metal tank is assosiated with Sewage Treatment Plant. Appeares to be empty. No indication of what tank held.
			P	041:24:42.2	088:08:52.4	There are two crushed above ground tanks at this location.
M105		PAS Survey Section 105				
M106		PAS Survey Section 106				
M107		PAS Survey Section 107				
M108		PAS Survey Section 108	P	041:22:00.8	088:09:06.2	1000 gallon tank for heater.
			P	041:21:57.9	088:09:03.6	1000 gallon tank for heater.
				041:21:53.2	088:09:04.4	1000 gallon tank for heater.
	718-2	Locomotive House	R	041:22:35.8	088:08:52.9	No vent/fill pipe was observed but the building was heated with fuel oil.
M109		PAS Survey Section 109	P	041:22:36.5	088:08:08.4	There appears to be an empty tank (250 gallon) sitting next to its cradle.
M110		PAS Survey Section 110				
M111		PAS Survey Section 111				
M112		PAS Survey Section 112				
M113		PAS Survey Section 113				
M114		PAS Survey Section 114				

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-5
SUMMARY OF SUMPS/DRY WELLS/SEPTIC/FLOOR DRAINS/OIL-WATER SEPARATORS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
L12		Doyle Lake Area				
L13		Group 68				
L20		Group 20	P			The treatment plant is currently operated by Alliant. This is currently the only operating wastewater treatment plant for JOAAP. Sludge is collected from this tank and removed off-site by a contractor.
L21		Group 23	P			There is a septic tank located at the intersection of Chicago Road and Central Road. Another septic tank is next to the water treatment plant, in the south of region L21.
	23-7B	Storage Shed	P	041:21:55.5	088:05:04.5	There is a latrine adjacent to this building at 23-23A.
	61-11	Power House for Crushing Plant	P	041:22:06.9	088:05:09.8	There are pipe chases in the floor of this building.
	62-27	Sentry Station (At Landfill)	S	041:21:34.9	088:05:37.0	We could not determine if this building is connected to a sanitary system or not.
L22		Group 25	P	041:23:32.2	088:03:58.8	An abandoned latrine was noticed between buildings 27-15 and 27-11.
			P	041:23:32.2	088:04:06.5	A latrine was observed between buildings 27-3 and 27-7.
L23		Group 27	P			There is a septic tank in the central north region of L23.
L24		Group 29				
L25		Group 62	P			Berm near Group 62 is from ditch cleanout. Ditches were cleaned out every 10 to 15 years and spoils would have been adjacent to ditches and possibly spread.
L26		Group 63	P	041:22:44.2	088:06:14.4	A latrine is near buildings 63-5 and 63-6.
			P	041:22:33.4	088:06:56.3	Latrine
L27		Group 64	S			There are several outhouses located 100' from respective buildings. (6-8)
L28		Group 65	P	041:20:45.4	088:03:35.2	Outhouse broken up on western end of site. Pump out present adjacent to house. Located at Gate and access road.
			P	041:20:29.2	088:03:22.6	Outhouse with pump out found at location. A junked truck immediately south of outhouse.
L29		Group 66	P	041:22:29.8	088:01:43.2	A latrine (66A) is located west of 66-51.
			P	041:22:46.1	088:01:39.9	A latrine is located west of 66-32.
L30		Group 66A				
L31		Extraction Pits				
L35		Fill Area				
L100		PAS Survey Section 100	P	041:21:51.9	088:07:13.0	An opening about 2x2' near a collapsed building could be a septic tank. It is mostly filled with dirt.
L101		PAS Survey Section 101				
L102		PAS Survey Section 102	P			There is a septic tank in the western part of L22, at the intersection of Chicago Road and Road North.
L103		PAS Survey Section 103				
L104		PAS Survey Section 104				
L105		PAS Survey Section 105	S	041:22:51.5	088:01:58.3	Observed what appears to be an outhouse constructed with transite just west of the fence of Group 66 between 66-4 and 66-5. May have a septic tank.
			S	041:23:24.0	088:02:17.4	Galvanized shed, old refrigerator, multiple foundations including a basement. Possible septic and well. Northwest part of L105.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicated no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-5
SUMMARY OF SUMPS/DRY WELLS/SEPTIC/FLOOR DRAINS/OIL-WATER SEPARATORS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
L106		PAS Survey Section 106				
L107		PAS Survey Section 107				
L108		PAS Survey Section 108				
L109		PAS Survey Section 109				
L110		PAS Survey Section 110				
L111		PAS Survey Section 111				
L112		PAS Survey Section 112	S	041:21:21.3	088:07:57.9	Maybe an old septic tank . It is a concrete pad near 18" x 18" opening.
L113		PAS Survey Section 113				
L116		PAS Survey Section 116				
	24-1A	Air Siren Building	S			Immediately north of the AST at this building, there are two clay stick-ups with metal lids, that appear to have water at about four feet below ground surface.
L117		PAS Survey Section 117				
L118		PAS Survey Section 118				
	64-36	Change House	P			Building list indicates that a septic tank (ST-64) is present here.
	65-35	Guard House	P	041:21:01.4	088:02:46.0	Building list indicates that a septic tank (ST-65) is present here.
			S	041:21:01.4	088:02:46.0	There are four clay sitck-ups with grated tops on the west side of the building. The PID read is background in 2 of exposed accesses (we are not sure of their purposes or functions). There is an underground sump with six four-inch pipes west of the building (we could not determine where they lead out to; possibly a drain field).
L119		PAS Survey Section 119				
L120		PAS Survey Section 120				
L121		PAS Survey Section 121				
M100		PAS Survey Section 100				
M101		PAS Survey Section				
M102		PAS Survey Section 102	P			There is a septic tank located north on Drummond Road, in the southwest portion of M102.
M106		PAS Survey Section 106				
M107		PAS Survey Section 107				
M108		PAS Survey Section 108		041:21:58.2	088:09:06.4	Septic - A latrine is located across from 811-124
			P	041:21:58.0	088:08:41.9	Septic - A latrine is located adjacent to 704-23.
	718-2	Locomotive House	P	041:22:35.8	088:08:52.9	A grease pit for working under trains is present with a drain at the base. The pit could connect to a septic field via one of the 4 pipes observed in the drain. A latrine is located immediately east of building. Indoor plumbing was retrofitted inside the building.
M109		PAS Survey Section 109				
M110		PAS Survey Section 110				
M111		PAS Survey Section 111				
	704-12	Yardmaster's Office	S			There is the possibility of a septic tank in this building.
M112		PAS Survey Section 112				
M113		PAS Survey Section 113				
M114		PAS Survey Section 114				

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicated no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-6
SUMMARY OF RADON FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Concentration (pCi/L)
L12		Doyle Lake Area			
L13		Group 68			
L20		Group 20			
L21		Group 23			
L22		Group 25			
L23		Group 27			
L24		Group 29			
L25		Group 62			
	62-3	Inert Storage (Fireproof) (Equ	041:21:06.5	088:05:35.0	Radon level is 5.30
L26		Group 63			
	63-9	High Explosive Igloos	041:22:42.5	088:06:32.6	Radon level is 24.80
	63-53	High Explosive Igloos	041:22:31.1	088:06:40.4	Radon level is 7.25
L27		Group 64			
L28		Group 65			
L29		Group 66			
	66-52	Finished Ammunition Storage Ma	041:22:28.	088:01:49.5	Radon level is 5.50
	66-72	Finished Ammunition Storage Ma	041:22:10.	088:01:47.8	Radon level is 5.70
	66-73	Finished Ammunition Storage Ma	041:22: 9.	088:01:55.6	Radon level is 13.30
L30		Group 66A			
	66A-123	Finished Ammunition Igloo	041:22:57.8	088:02:44.7	Radon level is 5.10
	66A-124	Finished Ammunition Igloo	041:22:59.7	088:02:49.6	Radon level is 6.70
	66A-125	Finished Ammunition Igloo	041:23: 0.3	088:02:53.	Radon level is 3.00
	66A-126	Finished Ammunition Igloo	041:23: 0.3	088:02:54.2	Radon level is 10.70
	66A-127	Finished Ammunition Igloo	041:22:59.4	088:03: 8.0	Radon level is 1.30
	66A-128	Finished Ammunition Igloo	041:22:55.9	088:03:15.6	Radon level is 4.90
	66A-129	Finished Ammunition Igloo	041:22:57.6	088:03:21.1	Radon level is 5.80
L31		Extraction Pits			
L35		Fill Area			
L100		PAS Survey Section 100			
L101		PAS Survey Section 101			
L102		PAS Survey Section 102			
L103		PAS Survey Section L103			
L104		PAS Survey Section 104			
L105		PAS Survey Section 105			
L106		PAS Survey Section 106			
L107		PAS Survey Section 107			
L108		PAS Survey Section 108			
L109		PAS Survey Section 109			
L110		PAS Survey Section 110			
L111		PAS Survey Section 111			
L112		PAS Survey Section 112			
	74-2	Residence			Radon level is 2.60

A=Absent, P=Present, S=Suspected, R=Removed.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-6
SUMMARY OF RADON FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Concentration (pCi/L)
	74-3	Residence	041:21:03.5	088:07:56.8	Radon level is 3.20
			041:21:03.5	088:07:56.8	Radon level is 3.90
L113		PAS Survey Section 113			
L116		PAS Survey Section 116			
L117		PAS Survey Section 117			
L118		PAS Survey Section 118			
L119		PAS Survey Section 119			
L120		PAS Survey Section 120			
L121		PAS Survey Section 121			
M99		TNT Block Area			
M100		PAS Survey Section 100			
M101		PAS Survey Section			
M102		PAS Survey Section 102			
	1101-1	Residence with Attached Garage			Radon level is 4.20
	1101-2	Residence with Attached Garage			Radon level is 2.80
	1101-3	Residence with Attached Garage			Radon level is 3.90
	1101-4	Residence with Attached Garage			Radon level is 2.60
	1101-5	Residence with Attached Garage			Radon level is 2.40
	1101-6	Residence with Attached Garage			Radon level is 2.60
	1101-7	Residence with Attached Garage			Radon level is 5.40
	1101-8	Residence with Attached Garage			Radon level is 4.10
	1101-9	Residence with Attached Garage			Radon level is 2.10
	1101-10	Residence with Attached Garage			Radon level is 3.20
	1101-11	Residence with Attached Garage			Radon level is 2.10
	1101-12	Residence with Attached Garage			Radon level is 2.40
	1101-13	Residence with Attached Garage			Radon level is 3.40
	1101-15	Residence with Attached Garage			Radon level is 4.10
M105		PAS Survey Section 105			
M106		PAS Survey Section 106			
M107		PAS Survey Section 107			
M108		PAS Survey Section 108			
	811-5	Magazine - Explosives	041:22:10.8	088:89:52.3	Radon level is 1.80
	811-6	Magazine - Explosives	041:22: 6.2	088:09:53.5	Radon level is 11.30
M109		PAS Survey Section 109			
M110		PAS Survey Section 110			
M111		PAS Survey Section 111			
M112		PAS Survey Section 112			
M113		PAS Survey Section 113			
M114		PAS Survey Section 114			

A=Absent, P=Present, S=Suspected, R=Removed.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-7
PCB FIELD SCREENING RESULTS
JOAAP, WILL COUNTY, ILLINOIS

Sample Matrix	Sample Date	Location	Comments	Results in ppm
Oil	12/7/95	L118	Electrical Box on water tower (67-4)	<50
Soil	12/11/95	L111	Fire Training Area	<0.5
Soil	12/11/95	M108	Below electrical box, Pole 0517 south of 811-125; stained soil	4.1 to 15
Soil	12/11/95	M108	Below electrical box, Pole 2406 south of 811-123; soil not stained (but pole was)	<0.5
Soil	12/11/95	M108	Building 811-124-Switch box; soil not stained	0.5-1.0
Oil	12/14/95	M111	Switch Box-labeled on front of 811-125, "starter conveyor motor 230 V"	<50[1]
Soil	12/12/95	L23	Beneath transformers in front of 27-1	<0.5
Soil	12/19/95	M108	Debris from drain in bottom of grease pit in Building 718-2	1.1 to 4

Source: FIEL01

[1] May be high end of range, based on color interpretation

TABLE 4-8
SUMMARY OF PCB FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
L12		Doyle Lake Area	S			PCBs are a contaminant of concern in this area according to the Installation Action Plan.
L13		Group 68	P			PCBs levels were below detection limits.
L20		Group 20	S	041:21:15.5	088:07:21.9	Pole 496: transformer
	20-4	Pump House	S	041:21:13.5	088:07:22.7	There is a ground transformer operating at this building.
L21		Group 23	S	041:22:09.2	088:05:11.8	Pole 271 and 272: 3 tranformers near 61-11
			S	041:21:34.4	088:05:37.5	Pole 802: transformer at landfill
			S	041:21:36.1	088:04:35.5	Poles 52 and 53: 4 pole mount transformers; adjacent to east deep well, 3 at about 15 kVA and 1 at 5 kVA.
			A	041:21:46.8	088:04:53.5	Pole 63: 3 transformers "non-PCB"
			S	041:21:45.0	088:04:52.4	Pole 64: transformers
			S	041:21:52.4	088:05:04.2	Pole 288 and 289: 3 transformers "non-PCB"; one transformer without sticker
			S	041:21:52.4	088:05:13.8	Pole 28: transformer
L22		Group 25	S	041:23:31.0	088:04:05.6	There is a pole mounted transforemer in front of Building 27-3. It appears to have one new and two old transformers that appear to be intact. Some galvanized metal pipes approximately twenty feet in length were also observed in front of the building.
L23		Group 27	A			Soil beneath the transformers in front of building 27-1 were field screened for PCBs (12/12/95) and had less than 0.5 ppm PCBs.
			S	041:23:32.1	088:03:53.5	A pole mounted transformer which appeared to be intact was observed in front of Building 27-1.
	27-5	Inert Storage Warehouse (Equip	S	041:23:28.4	088:03:42.	There is a large transformer, about 50 feet from west end of building along south wall, near pole 44. The soil beneath should be tested for PCBs.
L24		Group 29				
L25		Group 62	S	041:21:27.1	088:05:18.0	Pole 119: transformer, south of building 62-13 by 80 feet.
			S	041:21:22.2	088:05:13.3	Pole 783: Nestled in among 62-12, 13, 15 and 16 are 2 poles with 3 transformers
				041:21:33.0	088:05:20.7	Poles 107 and 106: between 62-17 and 62-14 there are 3 transformers
			S	041:21:11.8	088:05:50.8	Poles 189 and 190: 3 transformers
			S	041:21:12.3	088:05:40.9	Pole 194: 1 transformer, there are no evident stains.
			S	041:21:10.8	088:05:35.2	Pole 198 and 199: 3 transformers on cross beams.
			S	041:21:02.0	088:05:28.3	Poles 206 and 207: three transformers on cross beams.
L26		Group 63				
L27		Group 64	S	041:21:53.6	088:02:26.6	Pole 342: transformer; there is staining evident on ground.
			S	041:21:31.9	088:02:22.0	Pole 461: transformer, there is no staining evident on ground.
			S	041:21:27.8	088:02:23.4	Pole 445: transformer, there is no staining evident on ground.
			S	041:21:36.5	088:02:30.0	Pole 450: transformer, there is no staining evident on ground.
			S	041:21:29.2	088:02:36.5	Pole 436: transformer, there is no staining evident on ground.
			S	041:21:19.1	088:02:43.1	Pole 430: transformer, there is no staining evident on ground.
			S	041:21:21.5	088:02:32.3	Pole 440: transformer, there is no staining evident on ground.
	64-34	Standard Fixed Ammunition Stor	P	041:21:18.1	088:02:26.0	This building is used for PCB storage. A small pole mounted transformer is stored in a metal portable berm within the building. According to Nacy Yates, transformer contains oil with 61 ppm PCBs.
			P	041:21:18.1	088:02:26.0	PCB was stored here.
			S	041:21:18.1	088:02:26.0	This building has been designated as a PCB storage area.
			P	041:21:18.1	088:02:26.0	During an audit in 1986 this building contained a drained transformer.
L28		Group 65				
L29		Group 66	S	041:21:59.5	088:02:28.0	Pole 362: transformer; southwest corner of group.
	66-13	Finished Ammunition Storage Ma	S	041:22:15.3	088:02:11.8	Building 66-13 has sign "Danger PCB Storage"
			S			During November 1979, work was completed in building a storage area for transformer oil (PCB's) and contaminated materials.
			P			Drummed PCB contaminated liquids and solids were

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-8
SUMMARY OF PCB FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
L29						stored for over 30 days in this building.
			P			PCB was stored here.
			S			This building has been designated as a PCB storage area.
			P			A sign was attached to the door of this building which read "DANGER PCB STORAGE". This building could not be surveyed.
	66-34	Finished Ammunition Storage Ma	P			This building is used to store PCB contaminated equipment for longer than thirty days.
L30		Group 66A				
L31		Extraction Pits				
L35		Fill Area				
L100		PAS Survey Section 100	S	041:21:52.7	088:07:09.2	Pole 221: pole mount transformer, 5 kW
			S	041:21:53.9	088:07:47.4	Pole 256: pole mount transformer, 5 kW; outside appears oily, no stained soil visible
			S	041:22:22.4	088:07:19.4	Pole mount transformer at southwest corner of group 63, 5 kW (no pole)
L101		PAS Survey Section 101				
L102		PAS Survey Section 102				
L103		PAS Survey Section 103	S			North LAP Electric Substation is located here.
L104		PAS Survey Section 104				
L105		PAS Survey Section 105				
L106		PAS Survey Section 106				
L107		PAS Survey Section 107	S	041:21:57.4	088:02:28.7	Pole 685: possible power switch box on pole in far southeast corner of L107.
			S	041:22:27.6	088:03:26.6	Pole 283: transformer on Road 1 East, 50 yards south of Prarie Creek.
			S	041:22:34.1	088:03:25.2	Pole 282: transformer on Road 1 East, immediately south of Prairie Creek
			S	041:22:28.5	088:02:26.3	Pole 782: transformer and switch box at southwest of the western railroad siding.
L108		PAS Survey Section 108				
L109		PAS Survey Section 109				
L110		PAS Survey Section 110				
L111		PAS Survey Section 111	S	041:21:37.8	088:06:53.3	Pole 71: transformer
			S	041:21:23.2	088:07:39.4	Pole 260(?): Transformer
			S	041:21:23.5	088:07:36.3	Pole 268: transformer
			S	041:21:24.6	088:07:58.1	Pole 295: transformer
L112		PAS Survey Section 112	S	041:21:03.5	088:07:56.8	A pole mounted transformer is located along Rt.53 in front of building.
				041:20:38.3	088:07:51.5	Pole 335: about 125' north of 74-2, has transformer as well as pole 10' south of it. No pole number on second pole.
			S	041:21:18.0	088:07:27.7	Pole 193: transformer between Groups 8 and at northern end of L112.
			P	041:21:04.7	088:06:51.2	Pole 55: transformer just inside west fence of 412.
			P			PCBs levels were below detection limits.
L113		PAS Survey Section 113				
L116		PAS Survey Section 116				
	24-1A	Air Siren Building	S			Pole number 790 is immediately west of the building and has two transformers.
L117		PAS Survey Section 117	P			Soils of tract 61 were sampled in October and November 1990. Soil next to transfomer pad 4 had the highest PCB concentration of 25 ppm. The present leasing policy, requiring a 50 foot setback from the transformer pads, provides a more than adequate safety margin.
L118		PAS Survey Section 118	S	041:21:28.9	088:02:56.8	Pole mounted transformer.
			S	041:21:55.3	088:02:31.5	Pole 683/684 and 699: contain 3 pole mounted transformers. Pole 699 also has switch box.
			S	041:21:55.7	088:02:34.7	Pole 328: pole mounted transformers

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-8
SUMMARY OF PCB FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
L118	67-4	Tank, Elevated	A			An electric unit is located at the base of a water tower uprights. A 10 square feet oil stain is present below the unit. An oily/watery liquid standing inside the unit was sampled using DEXIL PCB analysis. Results were less than 50 ppm.
L119		PAS Survey Section 119	S	041:21:04.6	088:02:45.4	Pole 83: transformer east of building
L120		PAS Survey Section 120	S	041:20:24.7	088:04:33.1	Pole 518: pole mounted transformer
L121		PAS Survey Section 121				
M100		PAS Survey Section 100				
M101		PAS Survey Section				
M102		PAS Survey Section 102	S	041:24:25.7	088:08:32.4	Pole 2632D: 2 transformers
			S	041:24:23.7	088:08:17.9	Pole 4814: transformer
			S	041:24:41.4	088:08:06.6	Pole 2650 has 2 transformers located in Brown Circle Area. This is also the location of a former Sewage Treatment Plant.
			S	041:24:40.1	088:08:09.0	Pole 649: Transformer near Sewage Treatment Plant.
			S	041:24:37.6	088:08:07.6	Pole 2651: Transformer near Sewage Treatment Plant.
			S	041:24:39.5	088:08:05.2	Pole 2652: Transformer near Sewage Treatment Plant.
M105		PAS Survey Section 105	S	041:22:43.2	088:10:22.5	A ground surface transformer is located adjacent to the Well House at 411-2. The transformer has a green sticker indicating less that 50 ppm PCBs.
			S	041:23:26.0	088:10:27.2	Pole 229: transformer in eastern section of area.
			S	041:23:30.9	088:10:28.0	Pole 332: 300' north of pole 229, also has a transformer.
			S	041:24:09.2	088:09:42.2	Pole 1896: transformer located on eastern edge of M105.
			S	041:23:46.5	088:09:52.3	Pole 1357: transformer located on eastern M105, 1,000' south of Sellite and Box Factory.
			S	041:23:52.8	088:09:51.7	Pole 1348: transformer on located eastern M105, 100' south of Sellite and Box Factory.
			S	041:23:34.8	088:09:55.8	Pole 1341: transformer located on eastern M105, approximately 200 yards north of Sewage Treatment Plant.
			S	041:23:27.5	088:09:57.7	Pole 1336: transformer located on eastern M105 in front of 505-12 near Sewage Treatment Plant.
			S	041:23:15.1	088:09:57.6	Pole 1683: transformer on west TNT Road just south of M99.
				041:23:06.9	088:09:50.4	Pole 1673: transformer on west TNT road.
				041:22:57.2	088:10:06.2	Pole 033T: transformer
M106		PAS Survey Section 106	S	041:22:38.5	088:10:45.7	Pole 712B: one large transformer with "Non PCB" label and one small transformer without label adjacent to well.
M107		PAS Survey Section 107				
M108		PAS Survey Section 108	S	041:22:01.1	088:09:06.5	Pole 0528: 3 transformers
			S	041:22:00.8	088:09:06.2	Pole 2406: electrical switch, oil filled
			S	041:21:58.2	088:09:06.4	Pole 0523: 3 transformers
			S	041:21:57.9	088:09:03.6	Pole 2405: oil electrical switch
				041:21:53.2	088:09:04.4	Pole 0512: 3 transformers and electrical switch
			S	041:22:32.7	088:09:52.5	Pole 2496: transformer west of 811-1
			S	041:22:27.4	088:09:52.8	Pole 2501: transformer west of 811-2
			S	041:22:15.1	088:09:55.5	Pole A9: transformer west of 811-4
			S	041:22:14.7	088:09:45.5	Pole B10: transformer
			S	041:22:14.8	088:09:39.2	Pole C11: transformer near 811-33
			S	041:21:56.4	088:09:43.8	Pole C26: transformer near 811-37
			S	041:21:38.4	088:08:51.3	Pole 1561: 2 transformers
			S	041:21:58.0	088:08:41.9	Pole 0263B: 3 transformers adjacent to 704-23
			S	041:21:58.9	088:08:39.9	Pole 0264: 1 transformer near 704-23
			S	041:22:01.4	088:08:38.6	Pole 28: 1 transformer adjacent to gate 10
			S	041:22:13.6	088:08:40.5	Pole 0254A: transformer adjacent to 411-5 Pump House.
			S	041:22:35.5	088:08:51.5	Pole 1562: transformer
			S	041:22:41.8	088:08:41.5	Pole 1530: transformer adjacent to 707-13.
			P			Pole 0517: soils beneath the electrical box were field screened for PCBs (12/11/95) and contained between 4.1 and 15 ppm. Pole is south of 811-125.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-8
SUMMARY OF PCB FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Latitude	Longitude	Comment
M108			A			Pole 2406: Soil beneath electrical box was field screened for PCBs (12/11/95) and contained less than 0.5 ppm. The pole was stained but the soil was not. Pole is near 811-123.
	718-2	Locomotive House	S	041:22:35.8	088:08:52.9	A small amount of soil is present in the drain in the "grease pit." A sample was field screened (12/19/95) and was found to have between 1.1 and 4 ppm PCBs. PCBs may have been used for the locomotives.
	811-2	Magazine - Explosives	S	041:22:25.3	088:09:52.3	There were two electrical switches in front of igloo.
	811-123	Loading Dock - Explosive	S	041:22:02.1	088:09:06.2	There are 4 oil filled electrical switches on this building.
	811-124	Loading Dock - Explosive	S	041:21:59.3	088:09:03.3	There were 4 oil filled electrical switch boxes on the building. Soil beneath switch boxes was field tested for PCBs 12/11/95. PCBs were present between 0.5 and 1 ppm.
	811-125	Loading Dock - Explosive	S	041:21:53.6	088:09:04.2	There are 4 oil-filled electrical switches on this building and 10 square feet of stained soiled. An oil-filled electrical switch labeled "Starter conveyor motor 230 V" was sampled (12/14/95) and had less than 50 parts per million PCBs.
M109		PAS Survey Section 109	S	041:22:03.3	088:08:36.9	Pole 28: transformer on pole just south of gate 10 (200' south) on Base Line Road.
			S	041:22:13.0	088:08:02.8	Signal box on railroad tracks, adjacent to Rt.53, may be in use. Located 200' north of road leading to gate 10.
			S	041:22:13.4	088:08:08.9	Transformer, unlabeled pole 500' north of road leading to gate 10.
			S	041:22:37.4	088:07:45.8	Signal box is 500' south of building, get on railroad right away adjacent to Route 53.
			S	041:21:59.6	088:08:04.0	Signal box on railroad tracks adjacent to Rt.53 and immediatly north of road that leads to gate 10. Observed what appears to be another signal box 275' south of road leading to gate 10 on the railroad tracks along Rt.53. No coordinates.
M110		PAS Survey Section 110	S	041:21:39.8	088:08:08.0	Poles 026A and 0286: at Well and Pump House at 411-11, there is a transformer at a dual pole 35' north of the buildings. This transformer is larger than the typical unit we have seen at JAAP. There are 2 large electrical units inside the Pump House. Not sure what they are, but took pictures of each. The larger unit is marked "Westinghouse". See map for location of 411-11 (western M110).
			S	041:21:27.4	088:08:11.8	Signal box on railroad right-of-way adjacent to Rt.53. About 300 yards south of 411-11.
M111		PAS Survey Section 111	S	041:21:03.3	088:10:02.3	Pole 1353: transformer
			S	041:20:55.5	088:09:57.8	Pole 113: transformer
			S	041:20:56.0	088:09:10.1	Pole 90: transformer
			S	041:21:06.6	088:08:53.4	Pole 2599: transformer adjacent to 704-12
			S	041:21:05.3	088:09:05.2	Pole 2599T: transformer
			S	041:21:45.3	088:10:26.1	Pole 161: transformer at gate 4B
M112		PAS Survey Section 112				
M113		PAS Survey Section 113				

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the database or profile sheet in the Appendix.

TABLE 4-9
PCB ANALYTICAL SUMMARY FOR IRP SITES
JOAAP, WILL COUNTY, ILLINOIS

Site Description	Designation	Comments
Doyle Lake	L12	Nine sediment samples; two in holding pond greater than 1 ppm
Group 68	L13	No PCB samples
Group 20	L20	Analyzed in sediments from Prairie Creek only; not detected
Group 23	L21	No PCB samples
Group 25	L22	No PCB samples
Group 27	L23	One Pit sample; non-detect
Group 29	L24	No samples
Group 62	L25	Four soils; non-detect
Group 63	L26	Six sediment samples from Grant Creek tributary; not detected
Group 64	L27	No PCB samples
Group 65	L28	No PCB samples
Group 66	L29	No PCB samples[1]
Group 66A	L30	No PCB samples
Extraction Pits	L31	One surface water; non-detect
Former Burning Area	L34	18 soil and two sediment samples; one soil detect but below 1 ppm
Fill Area	L35	Two groundwater and four sediment samples; non-detect

Source: DAMO11, DAMO12

[1]Noted in 1988 Hazardous Waste Generator Survey that PCBs were stored in 66-13.

TABLE 4-10
SUMMARY OF EXPLOSIVE ORDINANCE/MATERIALS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Condition	Comment
L12		Doyle Lake Area	S		Explosives are a contaminant of concern in this area according to the Installation Action Plan. Media of Concern: Sediment. Contamination significant enough to warrant remediation was not detected during the investigation phase. No further action planned.
	1-51	Doyle Lake Dam	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
L13		Group 68	S		Consists of 23 Igloo-type Explosive Storage Areas. Media of concern: soil. Contamination significant enough to warrant remediation was not detected during the Investigation Phase. No further action is planned for this site.
			S		Alliant stores tracer materials, and tracer residuals and scrap in Group 68. The tracer material consists of powered metals which are received in a pellet form.
			S		Twenty-three earth covered magazines were available for the storage of explosive materials. Each had a capacity of 100,000 pounds. Magazine 68-1, 68-3, 68-10, 68-11, and 68-17 were surveyed and all were found to be clean and materials stored on pallets in an orderly manner.
			P		The sampling history at this site consists of four soil samples at the location of a fire that occured in July 1990 and involved a drum containing RDX, near igloo 68-15. The samples estimated that 13 cubic yards of soil were contaminated with RDX and HMX.
			P		Drums and boxes containing explosives, fuzes, projectiles, and miscellaneous materials set up on pallets were observed in some of the magazines. No evidence of any substantial spills, leaks or stained areas were noted during the 1991 inspection. A limited area of RDX and HMX contaminated was found during the Phase 2 RI.
			A		In October 1995, USEPA inspected this area. No evidence of explosive contamination was observed.
	68-1 throug 68-23	Storage for Fuzes, Primers & B	P	3X	Used for explosive storage; deconned to XXX.
	68-14	Storage for Fuzes, Primers & B	R		RDX and HMX sludges have been stored here in accordance with a RCRA permit. The drums were transported off-site and disposed of at a RCRA permitted facility in 1993.
	68-15	Storage for Fuzes, Primers & B	P		Three cubic feet of dry explosives were recovered during the cleanup of the isolated explosive sludge spill.
L20		Group 20			
	20-4	Pump House	A		A 1982 energy analysis does not indicate explosive hazards in this building.
L21		Group 23	P		Tetryl - Sealed bags, containing potentially contaminated coveralls worn by demolition workers, disposed in landfill. This is believed to be the landfill in L21.
			S		From the master plan dated July 1959, "Group 23 includes the two deep wells, water treatment plant, and the post burning ground (L2).
	23-2	Reservoir Pumping Station	A		A 1982 energy analysis does not indicate explosive hazards in this building.
	23-31A	Igloo	P	3X	Used for explosive storage; deconned to XXX.
	23-34	Superintendent's Office & Chan	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
		Superintendent's Office & Chan	A		A 1982 energy analysis does not indicate explosive hazards in this building.
	61-11	Power House for Crushing Plant	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	61-39	Blast Building	S		Ammunition was dissassembled outside of this building.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-10
SUMMARY OF EXPLOSIVE ORDINANCE/MATERIALS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Condition	Comment
L21		Blast Building	S		This building is a 3-sided concrete structure whose open side is in line with the opening of a large steel pipe. The pipe is perpendicular to the bulding and terminates in a box containing deflectors. A small indentation in a steel plate of the box indicate that projectiles were fired here.
	61-7	Crushing & Drying	P	3X	Explosives were processed in this building. The building was decontaminated to a XXX after shutdown but must be tested for residues.
			S		On September 25, 1978 rework of 109,000 105mm HE, 1CM, M444 complete rounds was begun. The ammunition was rejected due defective propellant charges. The estimated completion date was April 9, 1978.
			P		A 1982 energy analysis indicates explosive hazards in this building.
			P		Reworked shells containing explosives and repackaging depriming presses are located here.
			P		Ammunition was demilitarized in this building. Operations included pouring out powder propellant.
L22		Group 25			
L23		Group 27	S		Explosives are a contaminant of concern in this area according to the Installation Action Plan. This site is an inert material storage area and an incoming supply receiving area. Remediation of soil may be necessary.
			R		The sale of empty metal propellant drums and empty CBU containers has resulted in the complete elimination of all outside storage pads. All pallets formerly stored outside have been sorted and are now stored inside.
			P		Empty metal drums for 75MM and 105MM charges were stored outside, west of this group. The drums were sold to buyers with the understanding that they were contaminated.
	27-13	Inert Storage Warehouse	S		Explosive contamination is suspected at this building because large amounts of equipment were used in the handling of ordinance (dolleys, conveyers-rollers, racks, large diameter pipes-and more). A more detailed search of equipment and decontamination records is required.
	27-17	Inert Storage Warehouse	S		This warehouse is full. Contents are mainly apparently empty ordinance containers: examples are propellant cans and containers for tracers. The propellant cans are marked in some cases as 1X. A more detailed investigation is recommended for apparent environmental concerns.
	27-20	Warehouse	S		This building contains assorted production machinery. Also present are suspected ventilation equipment.
	27-21	Inert Storage Warehouse (Equip	S		This warehouse contains some equipment which may have been involved in ordinance manufacture.
L24		Group 29			
L25		Group 62	R		Empty propellant drums were shuttled from the operating groups after emptying, to this group for outloading to be reused for shipment of propellants. Sometime in 1971 or before, the drums were moved to Group 27.
L26		Group 63	R		2,115,600 pounds of TNT were relocated from this group to Group 811.
			P		This group consists of 78 igloo type magazines which contained high explosives, smokeless powder and finished ammunition. Each igloo was earth covered.
	63-1 thru 63-14 63 29 thru 63-43 63-50, 63-68 thru 63-78	High Explosive Igloos	A		A spade full of dirt turned over under one or both drains, as well as composite samples were examined for visible evidence of explosives or other contaminants. No evidence of TNT or other explosives

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-10
SUMMARY OF EXPLOSIVE ORDINANCE/MATERIALS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Condition	Comment
L26	63-1 through 63-78	High Explosive Igloos	A	0	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. This building was reclassified 0.
	63-79A	Latrine (Reported Excess)	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	63-79B	Latrine (Reported Excess)	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
L27		Group 64	S		In 1989, Honeywell began using this area for the production of AT4.
			P		Explosives that were stored here do not appear to have reacted, generated wastes or caused any contamination.
	64-1 thru 64-34	Standard Fixed Ammunition Stor	P	3X	Used for explosive storage deconned to XXX.
	64-3	Standard Fixed Ammunition Stor	P		TNT, lead, chromium and nitrate were detected in the 1989 study. It was concluded that widespread explosive contamination of the area had not occured.
	64-5	Standard Fixed Ammunition Stor	S		Some soil, near railroad tracks by door at southeast corner of building, had a slight red staining.
	64-8	Standard Fixed Ammunition Buil	P		TNT, lead, chromium and nitrate were detected in the 1989 study. It was concluded that widespread explosive contamination of the area had not occured.
L28		Group 65	P		Alliant currently utilizes 65-1 through 65-11 for munitions storage.
			S		In 1989, Honeywell began using this area for the production of AT4.
			P		This area was used for the storage of high explosives, smokeless powder, and finished ammunition. They are arranged in five evenly spaced rows, and are provided with lightning protection. No potential areas of concern were observed.
	65-1 thru 65-34	Smokeless Powder Igloos (In us	P	3X	Used for explosive storage; deconned to XXX.
	65-6,65-11 65-20 thru 65-33	Smokeless Powder Igloos (In us	A		A spade full of dirt turned over under one or both drains, as well as composite samples were examined for visible evidence of explosives or other contaminants. No evidence of TNT or other explosives was found.
	65-A thru 65-C	Latrine (Reported Excess)	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
L29		Group 66	R		A waiver permitting the outdoor storage of ammunition in the Igloo Area was endorsed. The outside storage consists of 155mm, H.E. Shells. This ammunition was scheduled for either renovation or demilitarization. All 650# TNT Navy Depth Bombs were scheduled to be removed. The outside storage of ARFO ammunition stored at Kankakee and the roadside storage of 90mm at the Elwood Ordnance Plant were scheduled for demilitarization or War Reserves.
	66-1, 66-8, 66-57 66-58, 66-82	Finished Ammunition Storage Ma	A		Composite samples were examined for visible evidence of explosives or other contaminants. The level of TNT detected was less than the primary remediation goals for JAAP.
	66-1 thru 66-6, 66-8 thru 66-12, 66-14 thru 66-23, 66-25 thru 66-34, 66-36 thru 66-44, 66-46 thru 66-14, 66-72 thru 66-80, 66-85	Finished Ammunition Storage Ma	A	0	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. These buildings were reclassified 0.
	66-32 thru 66-42 66-83 thru 66-88	Finished Ammunition Storage Ma	A		A spade full of dirt turned over under one or both drains, as well as composite samples were examined for visible evidence of explosives or other contaminants. No evidence of TNT or other explosives was found.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-10
SUMMARY OF EXPLOSIVE ORDINANCE/MATERIALS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Condition	Comment
L29	66-45	Finished Ammunition Storage Ma	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. This building was not reclassified because it contained used coveralls and gloves.
	66-66 thru 66-71	Finished Ammunition Storage Ma	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. These buildings were reclassified because they were locked (Master Lock) due to CFS Lease.
	66-7, 66-24. 66-35	Finished Ammunition Storage Ma	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. This building was not reclassified because it was locked (Best Lock).
	66-74 thru 66-80	Finished Ammunition Storage Ma	S		These igloos were assigned to the Bureau of Alcohol, Tobacco, and Firearms for the storage of explosives. A 1982 inspection found materials stored in generally good condition.
	66-81 thru 66-84	Finished Ammunition Storage Ma	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. These building were reclassified because they were locked (Master Lock) due to CFS Lease.
	66-86 thru 66-88	Finished Ammunition Storage Ma	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. These buildings were not reclassified because it was a locked RCRA Storage building.
	66-A thru 66-C	Latrine	A	0	These buildings are considered to be in 0 condition. They were not contaminated with explosives.
L30		Group 66A	P		This group consists of 41 magazines used for the storage of finished ammunition. This area was used for the storage of high explosives, smokeless powder, and finished ammunition.
	66A-100 thru 66A-107 66A-116 thru 66A-122	Finished Ammunition Igloo	A		A spade full of dirt turned over under one or both drains, as well as composite samples were examined for visible evidence of explosives or other contaminants. No evidence of TNT or other explosives was found.
	66A-89 thru 66A-129	Finished Ammunition Igloo	A	0	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. This building was reclassified 0.
	66A-A	Latrine	A	0	These buildings are considered to be in 0 condition. They were not contaminated with explosives.
L31		Extraction Pits			
	9-31	Lead Azide Storage Vault	P	3X	Explosives were stored in this building. The building was decontaminated to a XXX after shutdown but must be tested for residues.
	9-32	Fulminate of Mercury Storage V	P	3X	Explosives were stored in this building. The building was decontaminated to a XXX after shutdown but must be tested for residues.
L35		Fill Area			
L100 thru L111		PAS Survey Section 100 thru 111			
L112		PAS Survey Section 112			
	9-19	First Aid Building	R	5X	Building is not contaminated with explosives and/or has been converted to office building for administrative personnel and is considered to be in XXXXX condition.
	9-38A	Emergency Load Center	R	5X	Building is not contaminated with explosives and/or has been converted to office building for administrative personnel and is considered to be in XXXXX condition.
L113		PAS Survey Section 113			
L116		PAS Survey Section 116			
	24-1	Reichert Fire Station	A		A 1982 energy analysis does not indicate explosive hazards in this building.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-10
SUMMARY OF EXPLOSIVE ORDINANCE/MATERIALS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Condition	Comment
L116	62-25A	Superintendent's Office (North	A		A 1982 energy analysis does not indicate explosive hazards in this building.
L117		PAS Survey Section 117	A		Soil samples were taken in the area where an explosion had occured in 1942. No TNT or other explosives were detected in soil samples within track 61.
	2-27A	Guard House	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
L118		PAS Survey Section 118			
	3-27A	Guard House	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	3-27B	Guard House	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	64-35	Equipment Room (in use by Hone	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	64-36	Change House	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	65-35	Guard House	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			P		About one pound of propellant pellets was found on concrete pad, east of the building.
L119		PAS Survey Section 119			
L120		PAS Survey Section 120			
	1-46	Guard House (Test Site)	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
L121		PAS Survey Section 121	A		Group 28 was used as a pistol range. UXO should not be present at the range.
	65-36	Change House	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
M99		TNT Block Area	S		This section was formerly the TNT block area. All buildings have been demolished.
		TNT Block Area	S		An explosion occurred in the matrix of #3 press on February 15, 1944, causing a fire behind the barricade.
	704-16, 704-17, 704-20	Supervisor's Office	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	715-4	Storage Building, Oil & Kerose	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	719	Storage Building	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			A		During February 1981 this building was disposed of by controlled burning. Precautions were taken to ensure by-products from controlled burn were not a problem.
	722-13	Area Shop	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	841-1, 841-2	Receiving House	P	3X	Explosives were processed in this building. The building was decontaminated to a XXX after shutdown but must be tested for residues.
	842-1, 842-2	Pressing & Crimping House	R		During February 1981 this building was disposed of by controlled burning. Precautions were taken to ensure by-products from controlled burn were not a problem.
	842-3	Pressing & Crimping House	A		During February 1981 this building was disposed of by controlled burning. Precautions were taken to ensure by-products from controlled burn were not a problem.
	842-4	Pressing & Crimping House	R		This building was decontaminated by burning on February 28, 1977.
	842-5	Pressing & Crimping House	R		This building was decontaminated by burning on February 18,1977.
	843	Nailing House	P	3X	Explosives were processed in this building. The building was decontaminated to a XXX after shutdown but must be tested for residues.
M100		PAS Survey Section 100			
M101		PAS Survey Section			

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-10
SUMMARY OF EXPLOSIVE ORDINANCE/MATERIALS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Condition	Comment
M102		PAS Survey Section 102	A		Soil samples SS169-1 through SS169-7 were collected west of Brown Circle and were analyzed for explosives. No explosives were detected.
M105		PAS Survey Section 105	P		Eight groundwater samples have been collected from MW118 on the west side of this section. In 1981, 2,4,6-TNT (0.90 ug/l) was detected. In 1986, 1,3,5-TNB (9.54 ug/l) and 2,4,6-TNT (9.74 ug/l) were detected.
M105	739-1	Acid Resistant Putty Building	A		A 1982 energy analysis does not indicate explosive hazards in this building.
	814	Factory & Shook Storage	P		Fiber drums were used for DNT packaging with returned used drums being utilized when available.
			P		All TNT production was packed in F.T.C. fiber boxes during the period July 1, 1954 thru December 31, 1954 with used lids and bottoms supplying most of the packaging. Returned used fiber drums furnished twenty-eight percent of DNT packaging requirements. Returns of used boxes from other Ordnance installations improved greatly.
			P		In April 1996, this building evidenced gross contamination of what appears to be Activated Carbon Powder. The powder is spilled on the facility and presents a potential flammable, explosion and irritant hazard. Also present in the facility are hundreds of drums storing various labeled and unlabeled chemicals and catalyst compounds.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	TS-1242	Hut, Quonset	A	0	Buildings which were not contaminated with explosives are considered to be in 0 condition.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	TS-1243	Hut, Quonset	A	0	Buildings which were not contaminated with explosives are considered to be in 0 condition.
M106		PAS Survey Section 106			
M107		PAS Survey Section 107			
M108		PAS Survey Section 108	S		The Ordnance Ammunition Command asked to be advised should any further weakening of DNT drums be evident because of oil soaking through the liners into the drums themselves.
	1011-1 thru 1011-5	Overnight Storage Barricades	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	704-14	Supervisor's Office	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	704-23	Truck Inspector's Office	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	707-13	Change house	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	714-2	Storage Buildings - Tools	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
	718-2	Locomotive House	P		A sign on the building indicates "xxx". Bob Zerboglio stated that, Dinky cars that used to transport explosives in the production area were stored in this building.
			P	3X	Explosives were processed in this building. The building was decontaminated to a XXX after shutdown but must be tested for residues.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
			S	3X	There is a possibility of trace amounts of residual explosives contamination. This building was decontaminated to XXX condition and laidaway on July 20, 1976.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-10
SUMMARY OF EXPLOSIVE ORDINANCE/MATERIALS FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Status	Condition	Comment
M108	722-14	Carpenter Shop	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	8-30B	Latrine (near 718-2)	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
M108	811-1 thru 811-4	Magazine - Explosives	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. This building was not reclassified because it was locked due to ATF Lease.
	811-5 thru 811-10, 811-17 thru 811-24, 811-31 thru 811-38, 811-46 thru 811-53, 811-60, 811-62 thru 811-67, 811-75 thru 811-82, 811-92 thru 811 97, 811-90, 811-104 thru 811-111, 811-19, 811-121	Magazine - Explosives	A	0	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. These buildings were reclassified 0.
	811-61, 811-120, 811-122 thru 811-125	Magazine - Explosives	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. These buildings were not reclassified because they were either locked or not completely empty.
	811-8	Magazine - Explosives	P		Trucks and trailers requiring decontamination prior to service were brought to this building for cleaning. The cleaning involved sweeping the equipment to remove all visible explosive particles. The sweepings were placed in scrap powder containers.
M109		PAS Survey Section 109			
M110		PAS Survey Section 110			
M111		PAS Survey Section 111			
	704-12	Yardmaster's Office	A	0	This building is considered to be in 0 condition. It was not contaminated with explosives.
			A		A 1982 energy analysis does not indicate explosive hazards in this building.
	811-13, 811-15, 811-39, 811-83, 811-98, 811-112	Magazine - Explosives	P	3X	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. These buildings were not reclassified because they were either locked or not completely empty.
	811-11, 811-12, 811-14, 811-16, 811 25 thru 811-30, 811-40 thru 811-45, 811-54 thru 811-59, 811-68 thru 811-74, 811-84 thru 811-89, 811-99 thru 811-103, 811-113 thru 811-118, 811-127 thru 811-132	Magazine - Explosives	A	0	The Safety Office of the US Army Industrial Operations Command conducted inspections during the summer of 1996 to reclassify explosive condition of storage magazines. This building was reclassified 0.
M112		PAS Survey Section 112			
M113		PAS Survey Section 113	S		Low levels (upto 2.48 ug/l) of explosives (TNT, 1,3,5-TNB, and 1,3-DNB) were detected in groundwater. TNT was detected in MW151 and MW152 in 1982 and was not detected in subsequent sampling. TNB and DNB were detected in MW151 in 1988 but not previously. The RI concluded that these detections were not indicative of site contamination.
M114		PAS Survey Section 114			

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-11
PERIMETER INDUSTRIAL FACILITIES IDENTIFIED
JOAAP, WILL COUNTY, ILLINOIS

Facility	Operation	Location	Comments
Amoco Station	Fuel Dispensing	Mississippi Street in Elwood	Likely has USTs for Gasoline
JATA	Truck Maintenance	Bridge Road North of M102	
SNG Plant	Gas Light & Coke	Millsdale Ext. North of MFG area	Several very large bermed storage tanks
Liquid Carbonic	Carbon dioxide	Millsdale Ext. North of MFG area	
Stepan	Appeared to be oil refining	Van Drielingn Strasse Road North of MFG area	
Mobil	Oil Refining	East Frontage Road	
Joliet Polystyrene operated by BASF	Polystyrene	West of Route 55 on access road	
Dow Chemical		West of Route 55 on access road	
Unknown	Not-operating	At confluence of Kankakee River and GM&O RR	Several very large tanks present (about 0.5 million gallons)
Johnson & Johnson	Personal Products	Southwest corner of Peotone and Route 53	
PHIBRO TECH	Unknown	1/2 mile west of Johnson & Johnson	
James Tyler & Sons	Grain Storage; Weed and Feed Production	South of MFG area just west of Route 53	Former petroleum pipeline facility
Highway Department	Fuel Dispensing	Elwood-North of MFG area	2-1,000 gal. ASTs 1-diesel; 1-gasoline
Private Residence	Farm	East of LAP area	5-1,000 gal. ASTs
Private Residence	Farm	Immediate southeast corner of LAP area	2-500 gal. ASTs
	Petroleum Facility	1/2 mile northeast of LAP area	

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L12		Doyle Lake Area			Metals and anions are contaminants of concern in this area according to the Installation Action Plan. Media of Concern: sediment in surface. Contamination significant enough to warrant remediation was not detected during the investigation phase. No further action planned. No environmental concerns evident in walk around holding pond and perimeter walk of western side of actual lake. This is the portion of L121 which is considered agricultural tract 2. The former lessee has held a lease on this tract of an unknown period of time. The lessee stated that soil was excavated from Doyle Lake and spoiled on the southwest corner of tract 2. Doyle Lake is a 12-acre surface impoundment receiving surface runoff from L1, L2, L3A, L64 and partially from L10 and L27. Compounds washed out from these areas may have migrated and compacted the lack. All sediment samples collected in 1978 contained arsenic, lead, 2,4,6-TNT and two samples contained 2,4- and 2,6-DNT. In 1982, 1985, and 1986, surface water was sampled and contained only RDX.
L13		Group 68	041:21:22.9	088:06:26.2	A foundation was observed and a 30x10 pit is located with it. The pit contains an old rusted 55 gallon drum (empty) with holes, a 5 gallon pail (empty), cattle bones and wooden debris. Located north of 68-1.
			041:21:27.2	088:06:27.0	A second concrete pad is located 150 west of the aboved refernced pad. Wooden debris also. In 1990, this area was operated by Honeywell, Inc. This group contains 23 fuse, primer, and booster igloos. Water and sediment samples were taken in August 1990. The samples appear to be environmentally sound.
L20		Group 20			Sludge previously generated at the sewage treatment plant was disposed of at the former sanitary landfill in L21. This sewage treatment plant receives sewage from the LAP side of facility. The treated effluent discharges to Prarie Creek via NPDES permitted outfall. NPDES Permit IL 002666.
	20-4	Pump House	041:21:13.5	088:07:22.7	All flows in excess of 0.650 MGD are bypassed to the chlorine contact tank after receiving only primary treatment in the Imhoff tanks. The plant collection system is comprised of about 20 miles of gravity sewers, five lift stations and three miles of force mains. On August 18, 1970, the influent flow was black, and each plant unit was black. The receiving stream, Prarie Creek, was black and rocks near the outfall had a black coating. It appeared to be a combination of oily wastes. The evidence indicated that this condition had existed for a long time.
L21		Group 23	041:22:10.4	088:05:11.0	Unknown operation adjacent to 61-11; dirt mound and large diameter pipe with scaffolding for lifting. Photo 2-1-16.
			041:22:10.9	088:05:16.5	Two 5" clay stickup pipes about 3' tall adjacent to sewer junction box.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L21			041:21:47.6	088:05:41.2	2 foundations; one has 2 pairs of wide concrete pads 3' wide 30' long 1' high and set about 1.5' apart, the pairs seperated by about 12' of flush concrete with a trough running between pairs near corner of Central and Road 1 West.
			041:21:34.4	088:05:37.5	closed landfill; cap in good condition
			041:21:54.6	088:05:09.0	About 100 cubic yards of coal ash, pit about 40'x20'x4', 6 large dirt piles with metal pipes protruding from bottom, west of 23-7B.
			041:21:53.7	088:05:06.0	Foundation and 8" diameter well casing (about 30 lengths) on ground west of 23-7B.
					This is the portion L21 which is considered agricultural tract 79. The lessee has held a lease on this track for ten years.
					No environmental concerns were addressed in the lessee questionaire.
					Sanitary landfill designated to handle domestic garbage and waste. Approximately 2000-3000 feet of pipe with asbestos insulation are being removed.
					All waste materials are being disposed of here.
					Permit Number 1982-034-0p 19780401 - will county.
					Contaminants of concern were not identified here and therefore no risks were calculated.
					Household trash, plant trash, construction debris and sludge from the sewage treatment plant were disposed in the landfill. Two flooded pits and a berm are also located in this area. Areas of potential concern identified in historical aerial photos include a former coal storage area; a loading dock, and two concrete pads. No environmental impact was observed.
	23-7	Radio Maintenance Shop			Acetylene welding was conducted here.
	61-39	Blast Building	041:22:11.3	088:05:10.8	This building has a sight in line, with unknown operation in the area, and is built for possible blast process. There are pipe drums between this building and 61-7.
					No apparent environmental concerns in this poured concrete structure.
	61-7	Crushing & Drying	041:21:07.8	088:05:09.2	In 1977, activities related to demilitaration of 90 mm rounds were conducted here.
			041:21:07.8	088:05:09.2	This building was occupied by the Uniroyal safety office. There are grinding tools in the building and lead type. We were unable to determine if lead type was cast in the building.
			041:21:07.8	088:05:09.2	Rework operations were started here for the lots suspended due to light weighments of PA-66-1 propellant powder.
L22		Group 25	041:23:31.0	088:04:05.6	Various types of rail cars are parked on the tracks. Contaminants of concern were not identified here and therefore no risks were calculated. This area was a classification yard for receiving supplies shipped to JAAP by rail.
L23		Group 27			Metals are contaminants of concern for this area in the Installation Action Plan. This site is an inert material storage area and an incoming supply receiving area. Remediation of soil may be necessary.
			041:23:36.7	088:04:36.6	A blue painted 55 gallon drum was noticed in this

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L23					area. The drum appeared to be empty and the PID read 0 ppm. This site contains 22 warehouses. A small pit was used at this site to dispose of various waste. It was not known what type of wastes were disposed at this location. However, this area continues to be investigated as part of the IR program. JAAP personnel consider the potential for contamination in this area to be minimal.
	27-1	Inert Storage Warehouse ("B" P	041:23:32.7	088:03:46.1	In this building, there were four and a half pallets of asphalt roofing shingles (they appeared to be new).
	27-10	Inert Storage Warehouse (Equip	041:23:27.5	088:03:59.1	Heavy machinery and sealed boxes apparently containing machine parts, are present at this building.
	27-11	Inert Storage Warehouse (in us	041:23:27.3	088:04: 1.0	The building contains some furniture, large number of discarded boxes and associated packing pallets, and wooden framing for previous rooms.
	27-12	Inert Storage Warehouse (In us	041:23:27.6	088:04:12.7	There are small empty boxes at this building (cardboard and wood) containing decontaminating material. There is no apparent environmental concern from these boxes.
	27-14	Inert Storage Warehouse	041:23:27.4	088:03:51.3	The building contains packings with pallets and is almost empty.
	27-15	Inert Storage Warehouse	041:23:26.7	088:03:58.9	The building is empty. Inside the building is a small office office-like room which is also empty.
	27-16	Inert Storage Warehouse (Equip	041:23:26.8	088:04:11.1	The building contains large quantities of lockers, shelving, some furniture and machinery, and large number of pallets. The building needs to be surveyed for contamination.
	27-18	Inert Storage Warehouse (In us	041:23:25.	088:04: 1.7	The building is empty except for some pallets and crates which were also empty.
	27-19	Inert Storage Warehouse (Mater	041:23:24.4	088:04:13.3	Loading ramps went into this building. This building is empty and there are no apparent environmental issues and concerns.
	27-2	Inert Storage Warehouse (Mater	041:23:32.4	088:03:54.7	This building appeared to be clean. The floor appeared to be deteriorating in some places. One metal drum about 16inches in diameter and four feet high was full of trash. There are 20-gallon barrels filled with unknown trash at this building.
	27-20	Warehouse	041:23:22.4	088:03:56.9	There are seven air storage tanks at this building.
	27-22	Inert Storage Warehouse (In us	041:23:23.	088:04: 7.6	This building is now empty but was formerly used by the FBI to store unknown types of materials.
	27-3	Inert Storage Warehouse	041:23:31.6	088:04:00.5	The following are stored at this building: vehicles (boats, trailors, cars, snowmobiles, ATVs, outboards motors), furnitures, tools, autoparts, and pallets.
	27-4	Inert Storage Warehouse (Equip	041:23:30.5	088:04:12.5	No environmental concerns are apparent in this building.
	27-6	Inert Storage Warehouse (Equip	041:23:29.7	088:03:54.5	This partially empty building contains pallets, empty boxes and containers for munitions, some machinery, electrical switching systems for motors, but appeared to contain no dielectric oil.
	27-7	Inert Storage Warehouse (In us	041:23:31.1	088:04: 4.0	This building is empty.
	27-8	Inert Storage Warehouse (in us	041:23:31.6	088:04: 7.8	This building is empty.
	27-9	Inert Storage Warehouse (Mater	041:23:26.1	088:03:52.1	There is a wooden room for an office not attached to the building. The building contains stacks of pallets, loose planking on the floor, and a large number of empty

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L23					boxes, which were for supplemental charges.
	67-2	Tank, Elevated	041:23:30.3	088:03:30.6	The paint at the bottom of this tower is peeling off.
L24		Group 29			This group was formerly used as a classification yard for receiving incoming supplies transported by rail. Contaminants of concern were not identified here and therefore no risks were calculated.
L25		Group 62			Metal - Aerial photo indicates a large pile of dark material (possibly some kind of metal) located north of the Northern Warehouse Area. In addition, various unknown material were apparently stored outside the warehouses. No spills of potentially hazardous material are documented and there has been no report of potential contamination.
			041:21:32.1	088:05:20.2	Two 50'x 20' piles of old tires and shrubs adjacent to stream near west end. This is the portion L25 which is considered agricultural tract 28. The former lessee held a lease on this track for one year. The lessee noted that there were brick and rebar in the field. No other environmental concerns were addressed in the lessee questionaire. Contaminants of concern were not identified here and therefore no risks were calculated.
	62-3	Inert Storage (Fireproof) (Equ	041:21:06.5	088:05:35.0	Several large lathes were stored in what appeared to be an attempt to contain a storage area with plastic. Some lathes appeared to have been tested for PCBs, some cases of oil, some wipes, no signage indicated presence of PCBs. Other large machinery are located throughout the building. We could not determine what they were.
L26		Group 63			This group contains 78 high explosive igloos. Contaminants of concern were not identified here and therefore no risks were calculated.
	63-7	High Explosive Igloos	041:22:44.3	088:06:19.6	No apparent environmental concerns in this poured concrete structure.
	63-13	High Explosive Igloos			Oil, hydraulic fluid and antifreeze for forklifts are stored here.
	63-21	High Explosive Igloos	041:22:42.	088:06:25.3	No apparent environmental concerns in this poured concrete structure.
	63-26	High Explosive Igloos	041:22:42.1	088:06:53.5	No apparent environmental concerns in this poured concrete structure.
	63-47	High Explosive Igloos	041:22:29.0	088:06:06.9	No apparent environmental concerns in this poured concrete structure.
	63-53	High Explosive Igloos	041:22:31.1	088:06:40.4	This building is a poured concrete structure with no apparent environmental concerns.
	63-56	High Explosive Igloos	041:22:28.7	088:06:59.0	No apparent environmental concerns in this poured concrete structure.
	63-65	High Explosive Igloos	041:22:51.9	088:06:28.	No apparent environmental concerns in this poured concrete structure.
	63-67	High Explosive Igloos	041:22:51.3	088:06:38.2	No apparent environmental concerns in this poured concrete structure.
	63-75	High Explosive Igloos	041:22:48.0	088:06:33.0	No apparent environmental concerns in this poured concrete structure.
L27		Group 64			Lead is a contaminant of concern for this area in the Installation Action Plan. Remediation of soil

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L27					may be necessary. (The site contains 34 fixed ammunition magazines on 280 acres.)
					Some (about 4) piles of dirt and small gravel are observed in center of site. They are vegetated.
		Group 64			An area about 200'x40' between buildings 64-12 and 64-13 appeared to have been disturbed (eg. plowed). Soils are soft and vegetation is different than other in general area.
					Contaminants of concern were not identified here and therefore no risks were calculated.
	64-4	Standard Fixed Ammunition Stor			This building was used by JATA for storage until 1981. The area was in satisfactory condition when emptied.
	64-5	Standard Fixed Ammunition Stor	041:21:30.9	088:02:32.3	Vents on base of building around perimeter appears to have collected floor sweepings and residue.
			041:21:30.9	088:02:32.3	This building was used by JATA for storage until 1981. The area was in satisfactory condition when emptied.
	64-30	Standard Fixed Ammunition Stor	041:21:37.4	088:02:10.6	Vent around perimeter of the building appears to have collected floor sweepings and residue.
	64-31	Standard Fixed Ammunition Stor	041:21:30.1	088:02:20.2	Vent around perimeter of the building appears to have collected floor sweepings and residue.
	64-32	Standard Fixed Ammunition Stor	041:21:27.0	088:02:20.2	Vent around perimeter of the building appears to have collected floor sweepings and residue.
	64-33	Standard Fixed Ammunition Stor	041:21:23.2	088:02:24.9	Vent around perimeter of the building appears to have collected floor sweepings and residue.
	64-34	Standard Fixed Ammunition Stor	041:21:18.1	088:02:26.0	Vent around perimeter of the building appears to have collected floor sweepings and residue.
L28		Group 65			There are 2 piles of debris in form of railroad ties and other creosote treated lumber, between 65-10 and 65-11, both next to drainage ditch, occupying a 200 square feet area.
					This is the portion L28 which is considered agricultural tract 78. The current lessee has held a lease on this track for seven years.
					No other environmental concerns were addressed in the lessee questionaire.
					This group contains 33 smokeless powder igloos.
					Contaminants of concern were not identified here and therefore no risks were calculated.
					In 1959, this group was used for storage of items for production of a classified nature.
	65-4	Smokeless Powder Igloos (in us			Until October 1981, JATA used this building for storage. An inspection of the igloo by the GOCO following removal of the JATA materials found the area to be in satifactory condition.
	65-5	Smokeless Powder Igloos (in us			Until October 1981, JATA used this building for storage. An inspection of the igloo by the GOCO following removal of the JATA materials found the area to be in satifactory condition.
L29		Group 66	041:22:16.2	088:02:12.8	Dirt mounds 20'x10'x3' with metal and clay pipe mixed in.
					This group contains 88 finished ammunition igloos.
					Contaminants of concern were not identified here and therefore no risks were calculated.
					Platforms for storage of 155 mm HE shells were located between igloos 66-78 and 66-79, 66-80 and 66-81, 66-82 and 66-83, 66-84 and 66-85, 66-86 and

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L29					66-87, and three additional platforms on the south side of the rail spur.
	66-13	Finished Ammunition Storage Ma			There are no potential areas of concern and there has been no evidence of previous spills or releases at this site.
	66-52	Finished Ammunition Storage Ma	041:22:28.	088:01:49.5	No apparent environmental concerns in this poured concrete structure.
	66-72	Finished Ammunition Storage Ma	041:22:10.	088:01:47.8	No apparent environmental concerns in this poured concrete structure.
	66-73	Finished Ammunition Storage Ma	041:22: 9.	088:01:55.6	No apparent environmental concerns in this poured concrete structure.
L30		Group 66A			This is agricultural tract 69. The current lessee has held the lease on the tract for one year. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee. This group contains 41 finished ammunition igloos. Contaminants of concern were not identified here and therefore no risks were calculated.
	66A-123	Finished Ammunition Igloo	041:22:57.8	088:02:44.7	No apparent environmental concerns in this poured concrete structure.
	66A-124	Finished Ammunition Igloo	041:22:59.7	088:02:49.6	No apparent environmental concerns in this poured concrete structure.
	66A-125	Finished Ammunition Igloo	041:23: 0.3	088:02:53.	No apparent environmental concerns in this poured concrete structure.
	66A-126	Finished Ammunition Igloo	041:23: 0.3	088:02:54.2	No apparent environmental concerns in this poured concrete structure.
	66A-127	Finished Ammunition Igloo	041:22:59.4	088:03: 8.0	No apparent environmental concerns in this poured concrete structure.
	66A-128	Finished Ammunition Igloo	041:22:55.9	088:03:15.6	No apparent environmental concerns in this poured concrete structure.
	66A-129	Finished Ammunition Igloo	041:22:57.6	088:03:21.1	No apparent environmental concerns in this poured concrete structure.
L31		Extraction Pits			Area consists of 3 pits and numerous dirt mounds, some scrap metal and construction rubble in large pit and west pit. Contaminants of concern were not identified here and therefore no risks were calculated. No potential site-related contaminants have been identified in soils or surface water.
L35		Fill Area	041:21:52.9	088:06:11.8	There is a foundation at east end of dam. About 200' north of MW507 there are about 10 dirt mounds on top of slope to lake, small pit 10x5x3' deep, pit has an 8" diameter tree in it. Building 23-8 has been demolished. An earth filled dam accross Prairie Creek washed out in the Spring of 1947. The dam was repaired. This is surmised to be the dam forming Kemery Lake. Contaminants of concern were not identified here and therefore no risks were calculated.
L100		PAS Survey Section 100	041:21:51.9	088:07:13.0	Forty phone poles on ground, 4 building foundations, several empty 5 and 55 gallon containers, 2 collapsed buildings.
			041:21:53.9	088:07:47.4	foundations from former residences
			041:22:29.0	088:07:08.0	Pile of railroad ties, about 25
			041:22:40.4	088:07:23.0	Mound of dirt 20'x20'x3' and foundations, one with basement west of Group 63, empty crate labeled

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L100		PAS Survey Section 100			"1330-00-682-4645 G 927 Grenade, hand-riot M25AZ 0.7 cubed feet " This the portion of L100 which is considered agricultural tract 54. The lessee has held the lease of the tract for an unknown period of time. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee.
L101		PAS Survey Section 101			
L102		PAS Survey Section 102			
L103		PAS Survey Section 103			
L104		PAS Survey Section 104	041:23:41.8	088:02:44.1	A concrete pit and some concrete pads were noticed a half a mile west of Gate 20.
L105		PAS Survey Section 105	041:22:46.8	088:00:46.2	Multiple foundations and associated structures 200' northwest of Gate 22.
			041:23:24.0	088:02:17.4	Galvanized shed, old refrigerator, multiple foundations including a basement.
L106		PAS Survey Section 106			Multiple pits intermeshed for unknown reason. Located 400 yards south of Klinger Cemetary. This is the portion L106 which is considered agricultural tract 68. The former lessee held a lease on this track around 1960. The lessee noted that there were piles along the west side of tract which he believed were dumped there by JAAP. Soil appears to have been dumped in a former farm building on the site on the west side of the tract.
L107		PAS Survey Section 107	041:22:32.5	088:02:27.1	Visible staining along rail right-of-way on the eastern rail of the western siding.
L108		PAS Survey Section 108	041:21:57.5	088:03:32.8	House foundation, 40-50 year old trees observed within foundation. Located in far southeast corner of L108.
			041:22:44.5	088:04:27.0	A lake is present in the northwest corner of L108, about 40,000 square feet. A sign near Road 1 North says "TROUT Daily Limit 5 Possession 10"
	71-9	Commercial Truck Inspection Of	041:22:46.2	088:04:11.7	A water well pipe was observed.
L109		PAS Survey Section 109			The current lessee for agricultural tract 37 which lies on L109 has held the lease for 2 years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee.
L110		PAS Survey Section 110	041:22:27.0	088:05:42.2	Culverts and minor construction rubble are piled here. Piles along east side of Group 63, little or no debris in piles. The current lessee for agricultural tract 23 which lies in L110, has held a lease on this tract for 5 years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee. This is the portion of L110 which is considered agricultural tract 30. The current lessee has held the lease on this tract for two years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L111		PAS Survey Section 111			
L112		PAS Survey Section 112	041:20:55.0	088:07:36.7	Mounds of dirt containing concrete and rock rubble; no apparent environmental concern.
			041:21:14.5	088:07:41.2	No apparent environmental concern; rubble from buildings: concrete, wood, steel, shingles. South of Group 9.
			041:20:14.6	088:07:16.8	Wood and metal debris 5-10 yards south of Group 7.
			041:20:16.3	088:06:55.4	Depression 1/2 acre, south of Group 7.
			041:21:12.6	088:07:52.7	Various soil piles - Some pipes, inside fence that runs north/south on south end of Group 7. There are several large dirt piles and no visible debris in this area. Water and sediment samples were taken in August 1990. The samples appear to be environmentally sound.
	9-19	First Aid Building	041:21:23.4	088:07:22.2	Outbuilding 9-38A has a large lead acid battery inside.
	9-26	Sewage Pumping Station	041:21:13.4	088:07:23.7	This building was being used by Uniroyal Chemical Company (June 1993).
L113		PAS Survey Section 113	041:21:36.4	088:06:34.5	A disturbed area was found along an unmarked road along Prairie Creek. Characterized by a depression with a corresponding dirt pile commensurate with depression. Also scattered concrete and rock and other apparently non-hazardous rubble.
			041:21:36.5	088:06:04.5	An area along drainage ditch near Group 62 observed to contain fencing materials, bottles, glassware and various non-hazardous garbage. This is the portion of L113 which is considered agricultural tract 76. The current lessee has held the lease on this tract for seven years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee. MW138 is located near the northeast corner of M13. Explosives were detected in 1981 but were believed to be the result of cross contamination as no explosives have been detected in the three subsequent sampling events. Both 1,1,1-TCA (over 1,000 ug/l) and 1,1-DCA (10 ug/l) were detected in 1981 but were not detected subsequently.
L116		PAS Survey Section 116	041:21:24.9	088:04:50.3	Three piles, each about 200 square feet, are located down unmarked road near stream; piles contain wood/lumber.
	24-1	Reichert Fire Station	041:21:28.8	088:05:00.7	There is scattered debris throughout interior of the building, along with a paint can with residues, a battery, and Germ-O-Solver (didecyl dimethyl ammonium chloride).
	24-3	Oil Storage	041:21:29.6	088:05:00.8	There was an oil stain present on the floor of the building.
	62-25A	Superintendent's Office (North			There was a red stain on the east side of the building in former parking area. Art Holtz says this may be potash from farmers.
L117		PAS Survey Section 117	041:21:35.5	088:07:28.3	East of Group 2 about 1/4 acre area with scattered debris including: 5 gallon buckets, transite, concrete, railroad ties, various metals and wood. Material has apparently been present here for a long time as evidenced by moss growing on concrete and wood.
			041:21:14.0	088:04:35.2	5-10 building foundations, about 10 dump-truck size mounds of dirt, miscellanious debris, open

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L117		PAS Survey Section 117			concrete pit 3'x6'x3' deep, and transite.
			041:20:35.6	088:03:52.4	Building debris, metal and concrete 20'x5'x5' east of and between 3A and 1.
			041:21:02.3	088:04:08.9	Rubble pile including dump truckload size piles of dirt and asphalt on what appeared to be old parking lots from asphalt and concrete beam observations.
			041:21:02.6	088:03:47.4	Building foundation in woods east of 3A.
			041:21:07.5	088:03:50.9	Pit noted in Phase I & II Remedial Investigation by Dames & Moore at east side of group L10.
			041:21:20.0	088:03:55.2	Pile of dirt (apparently) vegetated near prairie grass 50x12x4. North of 3A about 30' north on fence line.
			041:21:40.0	088:04:12.0	Two piles; one bricks, one railroad ties and brush on north side of 3A about 40' south of railroad tracks. Both about 5x5x4.
					A debris area of approximately 1.5 acres is located here. Previous studies have observed it to contain primarily scrap metal, wood, and concrete. This debris is believed to be the remains of building 2-10 which was destroyed in an explosion in 1942. The debris in this area was not considered an environmental concern.
L118		PAS Survey Section 118	041:21:55.3	088:03:20.3	A pile containing about 15 cubic yards of building debris including transite.
			041:21:28.9	088:02:56.8	Water Towers - Upon inspection of soil directly under tower small diameters of hard grit in uniform size were observed. May be from sand blasting.
			041:21:37.6	088:03:01.4	A debris pile located adjacent to tracks contain wood, concrete and apparently sand blast grit. Pile about 50' long and 4' wide.
	64-35	Equipment Room (in use by Hone	041:21:53.2	088:02:33.5	A sign at the building indicates that battery service was conducted. A hoist support was still present in the building (to remove engines). JAAP staff confirmed that this building was for battery service. A sign on the building says "63-35", but 1964 master plan maps identifies the building as "64-35" and the buiding described by '64-35" seems to match this building.
	64-36	Change House			Some type of 3 pump system (lift station ?) is located 50 feet south of the building. The sign on the building says "65-36". The 1964 Master plan map shows a building "64-26A" at this location, and the 1988 building list description for 64-36 matches what was observed on site.
L119		PAS Survey Section 119	041:21:09.0	088:02:36.6	Three sets of concrete foundations south of Group 64 adjacent (north) of South Road.
			041:21:20.6	088:02:14.5	Slab and foundation and nearby pit (15'x4' deep) east of Group 64.
			041:21:56.4	088:01:34.9	Basement foundations with sewer pipe (4"). Also other foundations near by. Located about 200 yards west of gate 24.
L120		PAS Survey Section 120	041:20:29.8	088:04:22.4	End of parking lot at end of road on south side of Group 1 there are some vegetated mounds about 3' high. Area 300 square feet. Also small stand of trees. Looked at Sewage Lift Station on north side of Group 1, Building 3A-26. No concerns.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
L120		PAS Survey Section 120			A portion of L120 is agricultural tract 60. The former lessee stated that it appears soil has been dumped in the northwest corner of tract in an old building site. A portion of L120 is considered agricultural tract 48. The current lessee has held a lease on this tract for six years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee. A holding pond located in this section receives runoff from Group 1 (L7) and the Test Site (L11). Sediment samples from the pond contained measurable levels of 2,6-DNT and RDX.
	3A-26	Sewage Pumping Station			This building on the north side of Group 1 poses no environmental concerns.
L121		PAS Survey Section 121			There are 5 building foundations about 150 yards west of Gate 27. Depression immediately east of Gate 27 along fence line about 100x100'. 55 gallon drum empty in east flowing creek 100 yards from south fence line, 1/4 mile from east fence line. Concrete debris 100 yards east, drum on north side of creek referenced. Group 28 Pistol Range Backstop. Shell casings evident in building and general area. Five samples were collected in this tract and were analyzed for metals, explosive anions, and PCBs in 1993. No concerns were identified.
	65-36	Change House	041:21:02.5	088:02:45.7	This building has a metal shed with a metal roof.
M99		TNT Block Area	041:23:22.1	088:09:56.6	There are four 30'x 12' concrete pads just east, 12' from west TNT Road. They look old as evidenced by cracking and general weathered apperance.
			041:23:17.7	088:09:58.0	Wooden Junction Box Pipe (unknown type) evident crossing base. Unit has 1' of water in bottom. Dead animals present - southeast of M99. An exception was granted for the lack of quantity distance between Battery Station and Block Press Buildings in the Block Press Area. A muffler consisting of a drum packed with loose rock was installed on all presses to remove the oil from the press air exhaust.
	719	Storage Building			During February 1981, this building was disposed of by controlled burning.
	842-1	Pressing & Crimping House			During February 1981, this building was disposed of by controlled burning.
	842-2	Pressing & Crimping House			During February 1981, this building was disposed of by controlled burning.
	842-3	Pressing & Crimping House			During February 1981, this building was disposed of by controlled burning.
M100		PAS Survey Section 100	041:24:25.3	088:10:35.4	Culvert under railroad tracks carries water from south end of Mobil Oil about 400' from Gate 6 on to JAAP property.
			041:24:43.9	088:10:23.3	Possible seepage from pond between tracks onto JAAP.
M101		PAS Survey Section 101	041:24:49.8	088:09:31.8	Foundation and stone wall probable homestead.
			041:24:22.3	088:09:30.7	Clay outfall pipe possibly from MFG in creek bed near cemetery.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
M102		PAS Survey Section 102	041:24:42.8	088:08:52.6	There are three foundations at this location.
			041:24:33.0	088:08:17.6	Building rubble: concrete and pipe
			041:24:24.7	088:08:35.3	Concrete pads: 50x100' with railroad siding
			041:24:27.4	088:07:36.0	4 foundations, 10 rubble piles, 2 crushed above ground tanks.
					Some former employees believe that lead pipe may be associated with the Brown Circle Water Distribution System.
					This is the portion of M102 which is considered agricultural tract 169. The current lessee has held the lease on this tract for two years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee.
					The Sanderson and Porter wharehouse area was located west of Brown Circle. During the PAS field survey, tracks were noted in this area.
M105		PAS Survey Section 105			Along the western perimeter of area, there are multiple piles that contain large rocks.
			041:22:54.6	088:10:25.8	Two concrete pillars are located in this area.
			041:23:12.2	088:10:26.2	A second set of pillars (4) is located north of previous. This set also has a 3'x18" pad located 6' from the pillar. Pillars are only 6" tall.
			041:23:43.7	088:10:28.6	Another set of concrete pillars (pads western section) is located in this area.
			041:24:23.3	088:09:59.6	Another concrete pillar, pad in northern portion of site, 100 yards west of lever.
					Another set of concrete pillars, pad located in northern portion of site, 100 feet west of lever.
			041:24:17.2	088:09:40.6	Two large series of piles exist on both sides of Drummond Road as it heads NW/SE at the Northeast section of M105. Each pile is 250' long and 50' wide. Characterized almost exclusively with rocks and concrete, some pipe.
			041:22:58.4	088:10:01.7	2x2 metal cover encroached with vegetation, cannot access. Not sure what it is.
			041:22:47.9	088:10:30.8	15x15" pad area, has an access from the road and different vegetation covers than surrounding areas.
			041:23:06.9	088:10:26.1	15x15" pad area, has an access from the road and different vegetation covers than surrounding areas.
			041:23:26.1	088:10:26.9	15x15" pad area, has an access from the road and different vegetation covers than surrounding areas.
			041:23:55.3	088:10:28.6	15x15" pad area, has an access from the road and different vegetation covers than surrounding areas.
			041:23:40.6	088:10:25.6	15x15" pad area, has an access from the road and different vegetation covers than surrounding areas.
					This is the portion of M105 which is considered agricultural track 109. The current lessee has held the lease on the track for 5 years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee.
					This is the portion M105 which is considered agricultural tract 111. The current lessee has held the lease on the tract for 5 years. No other environmental concerns addressed in lessee questionnaire found in the Appendix were observed

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
M105		PAS Survey Section 105			by the lessee.
			041:23:06.0	088:10:27.2	There is a building containing glassware, and cords which gives the appearance of a laboratory, located 50 feet north of pole 229. Soil samples for tract 110 and 111 were taken in July 1990. The samples appear to be environmentally sound. Sediment samples contain high levels of sulfate and lead.
	814	Factory & Shook Storage			Box reconditioning, representing an appreciable supplement to the factory's output, was originally carried out in a building removed from the factory proper. Since this building was not suitable for tenancy in inclement weather, a new building, adjoining the box factory, was erected to house the reconditioning operation. Argonne National Laboratories cancelled the 3 year Permit No. Da-11-032-ENG-7188 to cover the use of storage space in the Box Factory Building. As of December 14, 1960, all machinery and equipment there had either been shipped to Argonne or moved to Building 713, under permit NO. DA-11-032-ENG-7028. In November 1959 approximately 25,000 square feet of floor area in this building, together with truck docks and rail facilities adjoining the building, were made available to Argonne National Laboratory in accordance with three year Permit No. DA-11-032-ENG-7188 issued to Atomic Energy Commision under date of November 20, 1959. The production of new boxes was greatly reduced during April 1 to June 30, 1943 because of an increased rate of return of used boxes from the loading plants as shown in Table 4. 515,944 returned boxes were reconditioned for reuse. Historic documentation indicates that a gas station, pump, and a 1,000 gallon tank were located on the south side of this building.
M106		PAS Survey Section 106	041:22:40.6	088:10:54.8	Pump: concrete steps, washing mashine, oven, miscellaneous metal, open hole (2'diameter and 3'deep), furnace, truck tires, 55 gallon drum some contents, burried waste near turn in road, scattered waste over about one acre, 3 foundations. Explosives (MW155 - 1,3-DNB at 7.28 ug/l and 2,6-DNT 5.45 ug/l), anions (sulfate upto 74,000 ug/l), and metals were detected in one or more groundwater samples from parcel 3. Soil samples (13) were analyzed for explosives and lead. No explosives were detected but lead was present in six samples at concentrations upto 138 ug/kg. One soil and one sediment sample were collected in 1982 at the outlet of a ditch that drains portions of M4 and M7. TNT, 2,4-DNT and 2,6-DNT were detected in surface water but not in subsequent upgradient samples. Lead was detected in sediment at a level of 197 mg/kg.
M107		PAS Survey Section 107	041:22:11.8	088:11:04.9	A 150' long flat stone fence and 1,200 square foot depression located in wooded area of central M107.

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
M107		PAS Survey Section 107			This area is east of the railroad tracks.
			041:22:33.2	088:10:56.4	Building foundation and other concrete debris. Picture taken. Located 250' south of Blodgett Road in 107.
			041:22:42.3	088:10:57.2	A 4'x7'x4' concrete case, made of 6" concrete, has a 1" pipe a top and a pipe that goes into ground. A 4" (well?) pipe is located 2' south of structure. Picture taken.
					More foundation 80' south of the latter concrete case, similar with pipes.
					A groundwater contaminant plume (sodium and sulfate) from M2 extends in to this section.
M108		PAS Survey Section 108	041:21:47.2	088:08:59.1	Broken tile drains have created open holes to several feet deep in the southeast portion of this section. Safety hazard.
			041:22:38.0	088:08:59.1	rubble pile 30x20x6'
			041:22:38.9	088:09:10.5	Outfall to creek from Tetryl Area ATF has Igloos 811-2,3,4
			041:22:01.9	088:10:01.4	Pit 50'x 50'x 15', no debris, well vegetated area has been extensively reworked.
			041:21:54.2	088:08:43.6	6 foundations, numerous dirt piles, 2 piles of broken asphalt
					Relatively high levels of heavy metals found in soil samples. A stricter sampling is recommended based on the results of this study.
					This is agrucultural tract 108. The current lessee has held a lease on this tract for 20 years. No environmental concerns addressed in lessee questionnaire found in the Appendix were observed by the lessee.
					This area contains igloos for storage of TNT, tetryl, DNT, and lead azide.
	411-5	Well Water Pump House	041:22:13.6	088:08:40.5	There were bags of Bentonite hole plug stored inside the building. These were used for well abandonment.
	707-13	Change house	041:22:48.1	088:08:38.6	The boiler room of this building could not be accessed. The building was probably heated with fuel oil. No tank was seen at this building.
	718-2	Locomotive House	041:22:35.8	088:08:52.9	No possible outfall from the building to the adjacent creek was found. The bank is stabilized with building debris (concrete slabs).
	811-122	Magazine - Explosives			This building contains lumber.
	811-2	Magazine - Explosives	041:22:25.3	088:09:52.3	This igloo was used by Alcohol Tobacco and Fire arms (ATF) units and was locked so we could not enter.
	811-5	Magazine - Explosives	041:22:10.8	088:89:52.3	This building is a poured concrete structured. There are no environmental concerns associated with this building.
M109		PAS Survey Section 109	041:22:13.0	088:08:02.8	Also a locker box here that looks similar to boxes at railroad that had batteries.
M110		PAS Survey Section 110			
M111		PAS Survey Section 111	041:21:14.1	088:10:24.1	Numerous dirt piles are at this location.
			041:20:57.3	088:10:20.5	There are 4 large foundations at this location.
			041:20:55.8	088:10:02.6	Explosive holding lot
			041:20:57.0	088:09:53.7	Explosive holding lot
			041:20:57.4	088:09:38.1	Explosive holding lot
			041:20:57.8	088:09:28.4	3 foundations along south patrol road
			041:20:57.2	088:09:18.7	Explosive holding lot

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

TABLE 4-12
SUMMARY OF OTHER FINDINGS
PROPERTY CONSIDERED FOR IMMEDIATE TRANSFER TO USDA
JOAAP, WILL COUNTY, ILLINOIS

Section	Building	Description	Latitude	Longitude	Comment
M112		PAS Survey Section 111	041:20:56.4	088:09:08.5	Explosive holding lot
			041:21:04.6	088:09:12.7	Miscellaneous railroad items, ties, parts, spikes, 5' diameter pipe and empty drums.
			041:21:15.0	088:09:17.8	Metal trough 3x20x2' rusted out, may have been stock tank.
					A groundwater contaminant plume (sodium and sulfate) from M1 extends in to this section.
					The Ordnance Ammunition Command asked to be advised should any further weakening of DNT drums be evident because of oil soaking through the liners into the drums themselves.
					This area contains igloos for storage of TNT, tetryl, DNT, and lead azide.
	811-70	Magazine - Explosives	041:21:31.8	088:09:33.7	No apparent environmental concerns. This is a poured concrete construction.
M112		PAS Survey Section 112	041:22:11.8	088:11:04.9	A 150' long flat stone fence and a 1,200 square feet depression located in middle of wood east of railroad tracks.
			041:20:52.0	088:10:57.8	Foundation with 20-30 year old trees growing through. Located near cow pasture in southeast corner of area.
			041:21:02.5	088:10:29.2	Dry pond about 180' diameter near railroad gate 5 about 120' south of railroad tracks and 50' west of Prairie Creek. Some portions of the pond side had a white substance caked to the side. It was salt-like in appearance.
					A groundwater contaminant plume (sodium and sulfate) from M1 extends in to this section.
					Two wells (M102 and M103) are located here. The samples were analyzed for explosives, metals and anions. The wells were sampled in 1981 and only chromium and sulfate were detected. Explosives, anions and metals were detected in one or more surface water samples and anions and metals but not explosives were detected in sediment samples. Neither VOCs nor BNAs were detected in surface water or groundwater. No explosives have been detected in soils from this area, lead (32 mg/kg) was detected in one sample.
M113		PAS Survey Section 113			A groundwater contaminant plume (sodium and sulfate) from M1 extends in to this section.
M114		PAS Survey Section 114			

A=Absent, P=Present, R=Removed, S=Suspected.
Blanks in the comment column indicate no findings.
References for each finding are cited in the profile sheets in Appendices B and C.

5. SUMMARY

USAEC has conducted a PAS and prepared this report for JOAAP which has been declared excess. This PAS is an evaluation of the existing facility and environmental conditions, regarding hazards and contamination for a portion of the property as discussed below. By an act of Congress, the JOAAP property will be transferred to the USDA, Veterans Affairs (covered by a prior PAS (PSCO01)), the State of Illinois, and Will County (BILL01). USEPA has identified each portion of JOAAP as either appropriate for or not appropriate for transfer at this time (RBOW01). Those portions of the USDA parcel (the "agriculture parcel") which USEPA identified as being potentially appropriate for transfer at this time were evaluated for this report (Figure 1-3).

The Congressional Act transferring this property states that the Army will transfer only those portions of the Arsenal property which the Secretary of the Army and the Administrator of USEPA concur that no further action is required under any environmental law and which therefore, have been eliminated from areas to be further studied (BILL01). This report will be used to assist the parties in reaching an agreement.

The PAS consists of the following four components: 1) a review of practically obtainable and reasonably ascertainable records; 2) a site survey; 3) interviews of knowledgeable persons; and 4) generation of the final PAS report. The objective of the PAS is to identify and document the presence or evidence of any hazardous or toxic substances, that trigger the CERCLA 120(h) Notice requirement and to identify other areas of potential concern to human health and the environment. A list of compounds used, stored, released or disposed on the USDA parcel covered by this PAS, and potentially subject to the CERCLA 120(h) Notice requirements is presented in Appendix E.

Records concerning historic practices and operations which could have resulted in the release or disposal of hazardous materials are incomplete. In addition, on-going

investigations continue to identify additional information relating to the nature and extent of contamination in previously identified areas of contamination. However, a diligent effort was made to identify potential problems so that the future owner could be notified and so appropriate decisions and agreements could be made concerning transfer of the property. The scope of this project did not allow for a detailed verification of the items reviewed; when data gaps or discrepancies were identified, the issues were investigated to the extent possible.

Issues with the potential to impact environmental quality or human health under the currently planned property use (i.e., transient public access, wildlife use, grazing, agricultural leasing for crops) have been identified in this PAS report. The majority of the environmental concerns at JOAAP have been previously identified and are currently part of the IRP. Most other issues identified are of minor impact and can probably be resolved through a Memorandum of Understanding or deed restrictions. However, some issues identified potentially involve non-quantifiable risks to human health. For example, transfer of buildings classified as having a 3X level of explosive contamination or property potentially containing UXO involves risks that are not quantifiable.

This section is organized by the type of environmental issues and summarizes broad categories. Information is organized by specific portions of the property and individual buildings in Appendixes B, C, and D. Findings are based upon currently available information, applicable regulations, and professional judgment. In some instances, information regarding a specific concern is incomplete.

Some general information regarding the nature and extent of contamination and regulations has been provided in the PAS. However, a detailed analysis of the nature and extent of contamination thought to be present at JOAAP and development of a comprehensive list of potentially applicable or relevant and appropriate requirements is beyond the scope of this task. References have been given throughout the document to direct the reader to an appropriate source for more detailed information. This document

reports findings based upon the conditions at the time of the field survey and available documentation.

5.1 Summary of Environmental Conditions

The following subsections present a summary of significant findings. The subsections in Section 5.1 correspond with those in Section 4. More detail concerning the findings and regulations can be found in Section 4, and the Appendices.

5.1.1 Hazardous Materials and Wastes

Hazardous waste or hazardous materials are those substances defined as hazardous by CERCLA, 42 USC 9601-9675, as amended, and the Solid Waste Disposal Act, as amended by RCRA, 42 USC 6901-6992, as amended. In general this includes substances that, because of their quantity, concentration, or physical, chemical or infectious characteristics may present substantial danger to public health or welfare or the environment when released into the environment. Information concerning permits held is presented in Section 2.2.3.

Both LAP and MFG Areas have been included on the NPL. Areas of environmental concern relating to hazardous materials and wastes have been studied since the 1970s under the IRP. These areas are discussed in Section 5.1.3.

Alliant Techsystems, Inc. has a RCRA permitted hazardous waste storage facility (USEPA ID number IL0210090049) in Group 68 (L13) consisting of seven igloos. Compliance with the terms of the permit (i.e., access restrictions and closure requirements) should assure adequate protection of human health and the environment.

The State of Illinois granted clean closure under 35 IAC 725 to hazardous waste storage areas 66-86, 66-87, and to 66-88 (USEPA ILD7213820460, IEPA 1970450027)

(JAAP16, EDII01). A report documenting the materials stored in these igloos was developed as a companion to the closure report.

Non-permitted storage (raw materials or product storage) is discussed in Section 4.1.1. The types of materials stored or used in the various buildings to the extent known are presented in Appendix E.

Information concerning the types, quantities and duration of storage of hazardous materials previously used at JOAAP is limited. In many cases, the only documentation available concerning the types of materials potentially stored in an area is the description of that area or building (i.e., High Explosive Storage Magazine). The information available has been collected and is provided as Appendix E so that the notice requirements of 40 CFR 373 can be met.

5.1.2 Solid Waste

Solid waste disposal and management is regulated under the Illinois Solid and Special Waste Management Regulations. Closure and post-closure requirements for disposal units are specified in 35 IAC 811.110 and 811.111

Several issues relating to solid waste were identified. A number of dumps and disposal areas are located around the facility. All major disposal areas are within the existing IR sites and only one, the sanitary landfill, is in the USDA parcel covered by this PAS. The closed sanitary landfill is located in the southwest corner of L21. Post-closure maintenance and monitoring requirements are designed to minimize the potential for the release of any contaminants that could be present and to allow for early detection of any releases that might occur. Some examples of typical closure requirements are: 1) the landfill cover should be maintained and the growth of trees and shrubs which compromise the cover should be prevented, 2) vehicular and animal traffic that damage the landfill cover should be prevented.

An area about 1.5 acres in size in L117 at the east end of L8 contains building debris. Reportedly, this debris is the remains of Building 2-10 which was destroyed by an explosion.

A small pit was used to dispose of various wastes at L23a (Group 27). It is not known what type of wastes were disposed at this location however, this area continues to be investigated as part of the IRP (DAMO25). Additional sampling was conducted in 1995, results of that effort will be reported in the FS.

A small debris area was observed in the south end of M106 during the field survey. The area contained a variety of items such as appliances, bricks, and scrap metal (FIEL01).

The L34 burning area, located in the central portion of the LAP area, is shown on maps dating back to 1944. The 1944 maps show two burning areas and access to the burning area via a railroad spur. The RI identified three separate burning areas within the site. The September 1996 PAS field visit found Burning Area 1 was heavily vegetated, Area 2 was also heavily vegetated in many areas, and Burning Area 3 was sparsely vegetated. A variety of debris was observed in Burning Area 2 including lids from munitions containers, several empty drums, railroad ties, ceramic pieces and fused glass. The ceramic items have been identified as non-metallic mine housings. Ceramic was observed eroding from the slope into Prairie Creek. A more through discussion of this area can be found in Appendix D.

Aged treated wood products no longer in use are subject to waste classification procedures in Illinois Administrative Code at 35.722.111 and 721.104(b)(9). IEPA has determined, in accordance with USEPA guidance, that weathered treated wood products (refer to Section 4.1.2 of the PAS for further definition) may be disposed of as solid waste. Based upon the interpretation of regulations presented in Section 4.1.2 and

discussions with state regulators (MEMO06), weathered treated wood products present at JOAAP can be abandoned in place.

A number of areas around JOAAP were found where debris was consolidated. No environmental impacts were visually apparent.

5.1.3 IRP Sites

The object of the IRP is to identify potential threats to human health and the environment and to subsequently take the steps necessary to minimize or eliminate unacceptable risks. The IR studies are conducted in accordance with the requirements of CERCLA and the NCP. This includes the determination of the nature and extent of contamination which defines the boundary of the CERCLA study areas. Descriptions of the IRP sites are provided in Appendix D.

JOAAP has fifty-three separate IRP sites as shown in Figure 4-1. General descriptions and environmental conditions at IRP site areas are presented in Appendix D. RIs have been performed at all of the sites and where appropriate, a risk assessment has also been conducted. A summary of the results of the risk assessment is presented in Table 4-2. Contaminants of concern were not identified at L21 and L22, L24 through L31, and L35 and therefore, no risks were calculated (DAMO23).

There are 35 IRP sites located in the LAP area of which 16 (L12, L13, L20 through L31, L34, and L35) are considered for transfer in this report. These sites were identified by USEPA as potentially ready for transfer (RBOW01). The Phase I RI found no evidence of environmental contamination at nine of the IRP sites (L20, L22, L24, L26, L27, L29 through L31, and L35) and these sites were recommended for removal from the RI process. No additional studies have been conducted at these sites under the IRP (DAMO06). Two additional sites (L25 and L28) were recommended for removal from

the RI process in the Phase 2 RI (DAMO13). All 11 sites recommended for removal from the RI process, are located in the Agriculture parcel.

Of the IRP sites on the MFG area, only M15 was considered potentially appropriate for transfer at this time (RBOW01). Therefore, the other sites are not addressed. However, the TNT Blocking Area discussed below encompasses the M15.

During conduct of the PAS, the former TNT Blocking Area (M99) was identified. It was subsequently decided that this area should be included within the TNT Ditch Complex IR study site M6. Due to the similarity of compounds expected to be present in this area, it has been designated area M6A.

The baseline human health risk assessments were used in conjunction with the RIs to determine sites requiring no further action. At study areas where site related contaminants were identified, potential risks to human health were calculated based upon RME scenarios. The RME provides a conservative estimate (i.e., well above average) of risk that is still within the range of possible exposures. Refer to Table 4-2 for risk characterizations.

Formal decision documents have not been written for the IRP sites. The Army is currently in discussion with state and federal regulators to establish sites which require no further action.

Sites potentially requiring further action have been grouped into OUs based upon the media of concern or type of site. The OUs have been further broken into RUs based upon the contaminants of concern. The OUs and RUs are discussed in Section 4.1.3.

PRGs were developed based on human health risk. The Army ecological risk assessment program for JOAAP was conducted to evaluate the risks associated with various scenarios including the absence of remediation (refer to Section 2 and 4.1.3 of the PAS

for a description of the Ecological Risk Assessment). The assessment determined that any adverse contamination-related toxic/health effect which are occurring or might occur in the future are not expected to significantly reduce the structure and function of any of the important aquatic and terrestrial components of the JOAAP ecological landscape. Specifically, fish and crayfish are not accumulating explosives and potential food-chain exposures are not occurring. For the terrestrial components, it was determined that neither rodents nor deer meat are accumulating metals above natural levels or explosives. Limited areas (considered *de minimus)* of impact to plants, earthworms, and micro-organisms have resulted from residual soil contamination (AEHA10, CHPM01, CHPM02, OHMC08).

In order to comply with CERCLA and the NCP, the ultimate clean-up levels must be protective of both human health and the environment. According to the law mandating the property transfer, areas requiring further study/remediation can not be transferred until it is agreed that no further action is necessary under any environmental law. Once the boundaries for the sites requiring further study and/or remediation have been agreed upon, the property available for immediate transfer to future owners can be identified. The boundaries of the IRP sites have not been established by land survey.

5.1.4 Asbestos

ACM remediation is regulated by USEPA, the OSHA, and the State of Illinois. Asbestos fiber emissions into the ambient air are regulated in accordance with Section 112 of the Clean Air Act, which addresses the demolition or renovation of buildings with ACM. TSCA and AHERA provide the regulatory base for handling ACM in kindergarten through 12th grade school buildings. AHERA and OSHA regulations cover worker protection for employees who work around ACM.

Two primary categories describe ACMs. Friable ACM is defined as any material containing more than one percent asbestos that, when dry, can be crumbled, pulverized or

reduced to powder by hand pressure (Appendix A, Subpart F, 40 CFR Part 763, Section 1, polarized light microscopy). Non-friable ACM are those materials that contain more than 1 percent asbestos, but do not meet the rest of the criteria for friable ACM.

Compliance with the Federal Property Management Regulations (FPMR) disclosure law was achieved through a base-wide asbestos survey conducted by Professional Service Industries, Inc. in 1993. This survey is available for review at building 74-3. Army policy is to remove friable asbestos which presents a threat to human health. Non-friable asbestos or friable asbestos which is encapsulated or in good condition is to be left in place and identified to the buyer per GSA precedent.

The personal property liquidation contract (DAAA08-96-C-0007, Section C) for JOAAP requires the liquidator to remove all friable type asbestos from the plant as identified in the base-wide asbestos survey. The liquidator will not perform asbestos removal in active buildings.

Non-friable asbestos containing materials are present in many of the buildings at JOAAP. These materials include of asbestos cement board building materials (i.e., siding, and roofing), asbestos cement pipes, and asbestos containing floor coverings. Activities such as sanding, grinding, machining, or crushing of these materials may result in the release of asbestos fibers.

Asbestos containing putty was manufactured at building 739-1 (M105). Two types of putty were manufactured containing between 45 and 53.1 percent asbestos. Raw materials handling procedures and waste disposal methods are not known. Putty production figures can be found in the annual historical reports for JOAAP.

5.1.5 Storage Tanks

USTs are subject to federal regulations within RCRA, 40 CFR Part 289, Technical Standards and Corrective Action Requirement for Owners and Operator of USTs. These regulations were mandated by the Hazardous and Solid Waste Amendments of 1984. The state of Illinois leaking UST program and the Federal corrective action requirement is implemented by USEPA. Illinois state law and IEPA regulations are still in effect.

A UST survey was conducted by USACOE in 1989. Reportedly, all tanks identified by this survey and in subsequent years have been removed. However, documentation of removals was incomplete and documentation of removal of USACOE tank numbers 41 and 105 in the land proposed for immediate transfer to USDA was not available at the time of this report. Attempts are underway to confirm the removal of all previously identified USTs. Follow-on confirmation will be provided to future owners if and when available.

A UST not previously identified was found at building 24-1 (L116) during the field survey. Pipes possibly indicating the presence of USTs were observed at Buildings 20-15 (L20), and 61-11 (L21) and within a foundation in L112. Additionally, historic documentation indicates that a gas station, pump, and a 1,000 gallon tank were located in M105 on the south side of building 814 south of Barrel House Road, and a second set of gas pumps was located at the intersection of West TNT and Tetryl Roads (KOWS01). It is unknown if USTs were associated with either of these pumps and if so, whether they remain in place. An inventory of USTs present at JOAAP and dates of removal are presented as Table 4-3.

Due to the age of the USTs, it is assumed that they do not comply with current regulations. Permanent closure of USTs must be conducted in accordance with 40 CFR 280.70 and state regulations.

Fifteen ASTs in various states of repair/disrepair are present on the USDA parcel. Details concerning the layaway procedures for ASTs are not known. It is possible that some of the tanks may not be empty or that some residual materials remain which could pose a hazard to human health or the environment. Findings related to ASTs are presented in Table 4-4.

None of the ASTs observed during the December 1995 survey had apparent leakage. However, it was not possible to see beneath some of the larger tanks.

5.1.6 Sumps, Dry Wells, Oil/Water Separators, and Septic Systems

Numerous septic systems were identified on property to be transferred to USDA. The majority of the systems serviced latrines. No environmental concerns relating to the septic tanks on the USDA parcel have been identified. County regulations specify that existing septic tanks be closed by pumping, collapsing at least one side so that the tank will not hold water, and filling with dirt. A representative of the Will County Health Department must verify the work (CODE01). No informatnion was found to indicate that any septic systems were used for disposal of industrial wastes. Findings concerning sumps, dry wells, oil/water separators, and septic tanks on the USDA parcel covered by this report are presented in Table 4-5.

The locomotive service pit in building 718-2 (M108) may have been served by an oil-water separator or septic tank. A walkover of the area during the field survey did not reveal the presence of this.

5.1.7 Radon Gas

USEPA suggests that remedial action be considered if the average annual radon level in the living area of a residence exceeds 4 pCi/l. A limited number of buildings at JOAAP have been surveyed for radon. Radon gas has been detected above the 4 pCi/l action level

in building 62-3 in Group 62 (L25), two igloos in Group 63 (L26), three igloos in Group 66 (L29), five igloos in Group 66A (L30), four residences in Brown Circle (M102), and one igloo in the 811 area (M108). The Army Radon Reduction Program calls for mitigation of regularly occupied structures with average annual radon levels over 4 pCi/l. However, as the Army does not intend to occupy these buildings, therefore the Army will not perform radon mitigation.

5.1.8 PCBs

Disposal of PCBs is regulated under TSCA, which banned the manufacture and distribution of PCBs with the exception of PCBs used in enclosed systems. By definition "PCB equipment" contains 500 ppm PCBs or greater. "PCB-contaminated equipment" contains PCB concentrations of 50 ppm or greater, but less than 500 ppm (40 CFR 761.3). TSCA (40 CFR 761.40) requires that all PCB transformers (transformers containing over 500 ppm PCBs) be clearly marked. By implication, a determination as to the PCB status of transformers is required. PCB transformers that are "in use" in a facility that is not totally enclosed must be inspected quarterly (40 CFR 761.30). PCB and PCB-contaminated equipment that is "out of service for disposal" can be stored for up to one year in a properly constructed PCB storage for disposal area (40 CFR 761.65). The disposal of transformers containing oil with PCBs over 50 ppm is regulated under TSCA (40 CFR 761.60). USEPA, under TSCA, regulates the removal and disposal of all sources of PCBs containing 50 ppm or more.

The PRGs developed for JOAAP soil included levels for PCB contaminated soils. Clean up levels for non-restricted access (10 mg/kg provided the soil is covered with at least 10 inches of soil containing less than one mg/kg PCBs) were adopted as the recommended PRG (OHMC08).

During the field survey, 127 transformers and approximately 20 oil filled electrical switches not posted with sampling results were observed in the parcels being prepared for

immediate transfer to USDA. It is not clear from the documentation reviewed and interviews whether all transformers and oil-filled electrical switches on-site have been tested for PCBs nor whether all transformers tested and found to contain PCBs over regulatory levels have been removed. The Army has funded the removal of electrical switch gear boxes from the MFG area. Start of work is expected in the Summer of 1996.

Locations from which PCB and PCB-contaminated equipment has been previously removed are not known. It is also not known if the equipment leaked prior to removal. Potential threat to human health and the environment can not be estimated.

The North LAP electrical substation is within the transfer parcel. No evaluation of potential PCB contamination has been conducted in this area. Standard operating practice at electrical substations during the period that this substation operated may have resulted in PCB contamination.

Oil-filled electrical switches were observed on three igloos in the 811 area (M111). Oil from one switch was field tested for PCBs and contained less than 50 ppm. Several of these switches are leaking. Soil beneath an electric switch on a pole south of 811-125 was field analyzed for PCBs. The soil contained PCBs at a concentration between 4.1 and 15 ppm.

5.1.9 Pesticide/Herbicide Use and Storage

The use of pesticides is regulated under FIFRA. Pesticide management activities are subject to federal regulations contained in 40 CFR 162, 165, 166, 170, and 171. Pesticides known to have been used at JOAAP have been identified in Section 4.1.9. Pesticides have likely been applied in and around buildings, along railroad tracks, along fencelines, and by lessees. The deaths of 21 cattle on agricultural tracts 2 (near Doyle Lake) and 23 (west side) was attributed to the application of pesticides in 1962. The areas where pesticides are known to have been mixed lie within IR sites and are

addressed as part of the studies in those areas. It is likely that some residuals remain from the use of pesticides on-site.

5.1.10 Lead Based Paint

DOD banned the use of lead-based paint in 1978. Any items painted prior to 1978 should be assumed to have one or more coats of lead-based paint unless testing indicates otherwise. The Residential Lead Based Paint Hazard Reduction Act of 1992 also known as Title X. Title X requires that buyers of residential property (excepting efficiencies, elderly housing, and housing for the handicapped) be informed that buildings built prior to 1978 may contain lead based paint. Specific notice requirements are spelled out in the act. Testing is not required nor is there a notification requirement for non-residential properties. Reportedly, the Brown Circle Area (M102) will be utilized by USDA for residential purposes.

Most facilities/buildings constructed prior to the Department of Defense ban on the use of lead-based paint in 1978 are likely to contain one or more coats of such paint. In addition, some facilities constructed immediately following the ban may also contain lead-based paint, because inventories of lead-based paints that were in the supply network were likely to have been used up on these facilities.

The condition of painted surfaces at JOAAP varies from good to poor. Routine maintenance, flaking, peeling, and chalking of painted surfaces may have resulted in past contamination. Due to the lack of continued maintenance, flaking, peeling, and chalking of painted surfaces is likely to continue. High levels of lead (up to 1,278 mg/kg) were found in paint chips found on the ground at Group 64 (L27). Similar contamination is possible in other locations.

Metal structures at JOAAP were routinely sandblasted and painted. Sandblast grit was observed in the soil beneath water tower 67-4 (L107) during the PAS field survey. In

addition, spent sandblast grit from water tower maintenance in 1991 or 1992 is known to have been placed in a parking lot immediately south of Group 1, and was spread on agricultural tract 14 (L23). A pile of sandblast sand was also observed at the turn in the access road to water tower 67-4 (L107); it is not known if this was spent sand (FIEL01, MEMO09). The Army has had the soil beneath several of the water towers tested for the presence of lead. Results will be provided to the future owner when available.

USEPA has developed some recommended action levels for lead in soil which are presented in Section 4.1.10. In residential scenarios, USEPA recommends using the Integrated Exposure Uptake Biokenetic Model to help determine appropriate action levels on a site specific basis.

5.1.11 Explosive Ordnance/Residues

Residue from the manufacture and disposal of explosives remains on-site. UXO is present at some locations on-site and no documentation concerning UXO clearance was found concerning one particular accident and so it is not possible to be certain that UXO is not present. Transfer of property and buildings potentially contaminated with explosives or UXO is contingent upon the approval of the DOD Explosive Safety Board (DDESB). AR 385-64 stipulates that real property contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until appropriate efforts to ensure protection of the public have been made. Further, all contaminated locations must be placarded appropriately with permanent signs that prohibit entrance of unauthorized personnel and the signs must be maintained in legible condition by DOD.

Explosives and explosive wastes/residue may be present in process lines, tanks, sanitary and industrial sewer lines, and within buildings where explosives were handled. An attempt has been made to identify all areas where explosives were handled and disposed. However, due to the extended history of the facility, and the incomplete nature of the

available records, it is not possible to positively identify all areas where explosives or munitions were used, stored, handled or disposed.

Historically, when underground process or waste lines were replaced, the old lines were abandoned in place. Wastewater lines containing explosives could pose a safety hazard if disturbed. No information relating to decontamination or testing of wastewater lines potentially containing explosives was found.

Documentation concerning the explosive contamination status for all of the buildings and facilities at JOAAP was not available at the time of this report. Based on available documentation, numerous buildings on the agricultural parcel have been assigned a XXX (3X) status. As discussed above, these buildings may not be released from DOD custody. Draft IOC 385-5 provides a mechanism for classifying/re-classifying the explosive contamination status of buildings and equipment based on non-destructive inspection methods.

Two areas potentially contaminated with UXO have been identified within the property covered by this report. Sand piles in L18 contain small caliber (up to 30 mm) projectiles it is not known if these piles extend beyond the boundary of L18. Alliant Techsystems is currently preparing a solicitation for removal of the projectiles and fragments. The second area is the vicinity of former building 2-10 which was destroyed in an explosion in 1942. This explosion involved M1 anti-tank mines and M1 mine fuses. Missile damage was reported to a distance of 3,700 feet. Part or all of PAS study sections L8, L9, L10, L21, L33, L34, L107, L108, L116, L117, and L118 lie within 3,700 feet of Group 2. These areas are currently a patch work of active and in-active LAP groups, agricultural fields, and woods. It is likely that UXO clearance was conducted immediately following the accident but documentation of the clearance was not available at the time of this report. It should also be noted that UXO was identified along Prairie Creek adjacent to site L2 during conduct of the RIs. The possibility that UXO has previously washed-out from this area exists.

During the field survey, propellant grains were found in front of building 65-35 (L118) these were subsequently removed (MEMO08). In addition, on the west side of L23 100,000 propellant drums possibly containing propellant residues were stored.

The Standard Fixed Ammunition Storage Magazines (64-1 through 64-34) in Group 64 (L27) are all classified as XXX. Ventilation spaces around the perimeter of the floor of each of the buildings have collected a significant accumulation of dust and dirt.

The former TNT Block Area is located west of M6. This area has a high potential for explosive contamination due to the types of activities conducted here. The boundary of M6 has been extended to encompass this area.

During the 1995 PAS survey, numerous apparently empty propellant and tracer containers were observed in building 27-17 (L23). Some of the propellant containers are marked 1X. Equipment believed to have been used in production operations was also observed in several of the buildings. The decontamination status of the equipment is not known (FIEL01). The presence of explosive contaminated materials in one of the inert storage warehouses indicates the possibility of explosives contamination in the other warehouses.

5.1.12 Biomedical/Biohazardous Materials and Wastes

No biological warfare agents have been used, stored or tested at JOAAP (ARMY01, FIEL01). All medical facilities have been closed for an extended duration and no evidence has been found to indicate biohazardous conditions exist at the facility.

5.1.13 Radioactive Materials/Wastes

Several radioactive sources were present in instrumentation within several LAP area groups. All sources have been removed and the NRC license for these sources is no longer active.

Several buildings at JOAAP were used by the Atomic Energy Commission in the 1950s. Not all of the buildings used are known nor are the types of activities carried out by the commission at JOAAP known.

Between 1983 and 1987, completed DU projectiles were brought on-site, packed into munitions, and test fired on the LAP area by Alliant Techsystems. The areas where the projectiles were present were screened by Alliant Techsystems, Inc. are reportedly free of elevated levels of radioactivity.

5.1.14 Laboratory Operations

Seven former laboratories were identified through field reconnaissance and records searches. Several pieces of broken laboratory glassware, a black residue, and half a drum set in the ground were found among several foundations in L21 at the southwest corner of Chicago and Central Roads (FIEL01). A second laboratory (Building 71-1) was located in L113 west of Group 62 and on the south side of Road ½ South (SPED01). The remaining are general purpose laboratories in M105 (JAAP10).

5.1.15 Wastewater Treatment and Discharge

Section 2.3.1 provides a general summary of wastewater activities at the JOAAP. The NPDES permit for JOAAP was issued on September 22, 1993 (IL0002666). The facility permit covers 19 discharges to various receiving waters.

The LAP sewage treatment plant (L20) is currently in operation serving Alliant Techsystems operations. Portions of the LAP treatment plant are no longer in use. No information concerning the closure or lay away of the facility were identified. Information concerning the lay away procedures and sampling conducted at the sludge drying bed (if any) was not found during the document review. These locations could accumulate high levels of metals and recalcitrant compounds over time.

5.1.16 Surface Water Resources

Previous studies have identified numerous site related contaminants in surface water and sediments. A list of contaminants of concern was presented in Section 4.1.16. The calculated cancer and non-carcinogenic risks for several water bodies exceeded acceptable levels for fishermen, fish consumers and resident children. Specifically, the carcinogenic risks were greater than 1×10^{-6} for consumers of fish from Kemery Lake (due to arsenic, and beryllium), Jackson Creek (due to arsenic), and Grant Creek (due to 2,6-DNT and 2,4-DNT); for fishermen in Kemery Lake (due to arsenic, and beryllium), and Grant Creek (due to 2,4,6-TNT), and for resident children in Kemery Lake (due to arsenic and beryllium) and Grant Creek (due to 2,4,6-TNT). The hazard index (non-carcinogenic risks) was greater than one for consumers of fish from Prairie Creek (1,3,5-trinitrobenzene) and Kemery Lake (due to arsenic, and beryllium). There are a number of uncertainties associated with the risk numbers that should be reviewed when using the numbers for decision making. For example, some of the unacceptable risks to fish consumers were due to arsenic and beryllium which accumulate in portions of fish (i.e., bones) not generally consumed by humans.

The Army has determined that the aquatic components of the ecological landscape at JOAAP are not significantly impacted by contamination as defined by the assessment endpoints of the ecological risk assessment program. In specific, it has been determined that the fish and crayfish collected are not accumulating explosives and potential food-

chain exposures are not occurring. In addition, it was determined that benthic macroinvertebrate communities are not significantly impacted.

In addition, until primary and secondary contaminant sources have been remediated, the potential remains for contaminants from the IR sites to impact surface water and sediment quality. For example, at L1 surface water run off appears to be carrying contaminated soils along a drainage ditch towards to Prairie Creek and groundwater at the site discharges to the creek. Potential future impacts, if any, have not been determined.

5.1.17 Soils

Soil contamination is a major concern at many of the IR sites. Contaminants of concern in soil at the IR sites are discussed in Appendix D. Wind borne dust, surface water runoff, and/or groundwater migration from the IR sites could result in secondary soil contamination. The possibility of secondary soil contamination will be reduced or eliminated once remedial measures are complete.

Wastewater and potentially contaminated stormwater run-off was discharged to ditches located throughout the facility. Periodically, sediment deposited in the ditches was removed to improve flow. The removed sediment was reportedly spread on the ground adjacent to the ditches (FIEL01).

The former pistol range (Group 28) located within L121 consists of a portable building, a firing line, and a soil backstop. A large number of spent shot gun shells, and small arms cartridge casings were observed near the firing line. Upon impact, lead is abraded from the projectiles and is left in the soil.

A 1967 survey of the sewer system found severe infiltration problems. Pipes in a state of repair allowing infiltration are also likely to allow exfiltration. In addition, infiltration and exfiltration could occur in the same segment of pipe at different times (e.g., during

droughts or wet weather) which could result in soil contamination. Wastewater lines may contain explosive residues. Plant demolition plans developed by Uniroyal identify specific procedures for closure of sewer lines within the Groups and manufacturing areas. These plans also provide protocols for sampling soils near the lines. Historically, when lines were replaced, the old lines were abandoned in place.

During the December 1995 field survey, dirt mounds scattered around facility of unknown origin were observed. Several mounds contain protruding debris such culverts and pipes and some do not support vegetation (FIEL01). The locations of many of the dirt mounds are presented in Table 4-12.

5.1.18 Groundwater

The Illinois Groundwater Protection Act (Illinois Public Act 85-863) was created to protect the chemical quality of the state's groundwater. This act empowers the IEPA to set quality standards for groundwater within the state. Illinois Groundwater Quality Standards, IAC 35 Subpart D, regulate various aspects of groundwater quality including establishing criteria for groundwater classification, nondegradation provisions, standards for groundwater quality, and various procedures and protocols for management and protection of groundwater.

Shallow groundwater quality at JOAAP has been extensively studied as part of the IRP and a number of areas of contamination have been identified. However, due to the types of activities and the duration during which they were carried out there is the possibility that some groundwater contamination has not been identified. Based upon data relating to known areas of contamination, the extent of any unidentified plumes of groundwater contamination is likely to be limited.

The glacial till aquifer is not utilized at JOAAP. A survey of residences indicated this aquifer is not used in the surrounding area. Elevated concentrations of several naturally

occurring compounds were found in the glacial till groundwater rendering the water undesirable for domestic use, and in many cases, agricultural or industrial uses. All of the JOAAP related groundwater contamination is found in the glacial till and portions of the Silurian dolomite aquifer. The contamination is in most cases localized. In addition, the low yield (one gpm) associated with the glacial till aquifer makes it undesirable for any usage. The glacial till groundwater is not considered potable and has been designated a Class II (General Resource) aquifer (DAMO08). The underlying Silurian dolomite aquifer appears to meet the yield requirements for Class I (Potable Resource) aquifers, although groundwater from the dolomite may require treatment prior to use.

Production, monitoring, fire protection, and farm wells are present at JOAAP. The wells are identified in the RIs. The coordinates of all wells which have been sampled and the analytical results can be obtained from the Army Installation Restoration Data Management Information System (IRDMIS). Construction, modification, and abandonment of wells is regulated by the Illinois Water Well Construction Code (415 ILCS 30/1 et seq.). Modification of existing wells triggers the requirement that they be brought into compliance with current regulations. Information on the current condition of all wells, current well use, and likely future well use has not been compiled. The Will Count Health Department is flexible in its determination of what constitutes an abandoned well. A rule of thumb used is that wells not used for a full year may be considered abandoned.

5.1.19 Noise

On-going activities of Alliant Techsystems, such as test firing of munitions and any associated noise are expected to continue for some time. In addition, some noise associated with demolition or remediation may also be generated. Until the specific types of activities to be conducted are known, the volume and duration of noise to be expected can not be determined.

5.1.20 Drinking Water

Public water systems are regulated under 40 CFR 141. Public water systems are those that serve 15 or more connections or 25 or more people. Public water systems are those whose water is used for drinking, cooking, bathing, or hand washing. Drinking water quality standards, Maximum Contaminant Levels (MCLs), appear in 40 CFR 143.

Former JOAAP employees reported that the Brown Circle Water Distribution System may have lead pipes. In addition, the future owner should be aware that due to the age of the facility, copper piping and lead bearing solder were probably used. Lead exceeded the USEPA action level and naturally occurring radon levels exceeded MCLs within portions of the potable water system piping.

5.1.21 Perimeter Survey

Airborne emissions from nearby industrial facilities have the potential to impact environmental quality at JOAAP. An area of possible run-on from Mobil Oil was identified on the west side of M100. There was no visual evidence of impacts from off-site facilities nor was any documentation of impacts to JOAAP found.

An industrial area located west of Route 53, across from the current JOAAP administration building (74-3), houses three business on property that was formerly a large petroleum facility which was served by a pipeline. The businesses are Tyler Enterprises which manufactures herbicides and fertilizers, Tyler and Sons which is a grain company, and Tyler Realty (MEMO09).

5.1.22 Spills

Records concerning spills are incomplete. Numerous spills have occurred and all but a few of the significant spills identified were within IR sites (refer to Section 4.0 for a

summary of all identified significant spills). Only one spill was identified that is known to have occurred or impacted the property proposed for transfer to USDA under this report. However, numerous releases from operations have occurred and these releases may have impacted sediment quality in streams and drainages.

On June 10, 1968, it was determined that oil in Prairie Creek was released from the Group 3 Power house (Building 3-1) via the storm sewer. A heavy coating of oil was present on the sides of the drainage ditch. A drag chain cleaning of the sides of the banks was planned (JAAP26). Documentation was not available to verify that this cleaning was conducted. No surface evidence of the spill was noted during the December 1995 PAS field survey.

5.1.23 Miscellaneous Findings

Dirt mounds scattered around facility are of unknown origin. Several mounds contain protruding debris such culverts and pipes and some do not support vegetation. The origin of these piles is not known. The locations of many of these piles are presented in Table 4-12.

Tile drains at JOAAP are currently being identified and mapped by USDA. These drains were installed to drain lands so that they could be used for agriculture or other purposes. Drains if present in areas of contamination could act as a conduit accelerating contamination migration.

Group 45 located in PAS study section L112 consisted of six buildings in existence at the time the land was purchased and remodeled for use as an auxiliary fuse loading line in WWII. The line was designed to provide facilities for performing miscellaneous reclaiming operations. The buildings were placed in stand-by status in 1945 (ACOE06). The buildings have since been demolished (BICO01). It is unknown if the buildings were used between 1945 and the time of demolition. Based upon the name of the group and

the limited information available, operations in Group 45 may have been similar to early operations at L14 and L15.

There were scattered empty drums around the facility. No environmental concerns were visually apparent relating to the drums. Locations of the drums are identified on Table 4-12.

Building 64-35 (L118) was used for battery service. It is unknown how waste acid from this shop was disposed of.

A former fire training area was identified north of L18. The boundary of L18 has been extended to include this area.

5.2 Summary of Major Findings

A brief summary of major environmental conditions/findings on the parcel for transfer to the USDA is presented below. The Army is currently addressing some of these findings and is developing plans to address others.

- Explosive classifications were not found for all buildings. Numerous buildings in the proposed transfer parcel are classified as 3X meaning that they pose a potential safety hazard. Under AR 385-64, areas posing a potential safety risk to the public may not be released from DOD custody.
- Spoils from the cleaning of sediment from drainage ditches which carried wastewater were reportedly deposited adjacent to the ditches. No characterization has been conducted to determine if the periodic clean out has resulted in redepositing of contamination adjacent to the drainage ditches.
- Wastewater lines may have explosive contamination which could pose an explosion hazard if disturbed.
- Wastewater lines reportedly leaked extensively. Only limited sampling has been conducted along the wastewater lines to determine if soil contamination is present.

- UXO may be present in areas within the range of missile damage from the Group 2 explosion, along Prairie Creek adjacent to L2 and Prairie Creek downstream of L2 where UXO has previously been identified.

- In several of the surface water bodies, the human health risk assessment identified exposure scenarios with unacceptable risks.

- Illinois code requires that wells that are out of service be abandoned.

- Elevated radon levels (above MCLs) are present in some portions of the water distribution system. Lead based solder may have been used on water pipes and the USEPA action level for lead in water may also be exceeded in some portions of the water system.

- Lead-based paint is likely to be present on any surfaces painted prior to 1979.

- Non-friable asbestos is present throughout the facility in cement board siding, roofing, flooring and insulation.

- Transformers and oil-filled electrical switches are present on-site. It is not clear if documentation of sampling of the oils is available for all of these items. Oil-filled electrical switches on the MFG Area are currently being removed.

- Both ASTs and USTs are still present.

Detailed findings by study section number are provided in Table 5-1. This table lists the JOAAP study section (described in Section 3.0) and the findings relating to that parcel

All actions taken on this property either in response to the environmental concerns identified within this report or those that are independent of environmental issues (i.e., general improvements and development activities) must comply with the requirements of NEPA and AR 200-2. Minimally, these requirements protect archeological and historically significant features that have been identified at JOAAP as well as ecological resources such as threatened and endangered species.

TABLE 5-1
SUMMARY OF FINDINGS BY SECTION
JOAAP, WILL COUNTY, ILLINOIS

Section Number	Description	Findings
L12	Doyle Lake Area	Dredge spoils from lake were spread on L121.
L13	Group 68	Several buildings in this Group are designated XXX. Must re-classify explosive contamination status or decontaminate to 5X prior to transfer. Active RCRA storage permit for several igloos used by Alliant Techsystems. A limited area of HMX and RDX contaminated soil is present from a trailer fire.
L20	Group 20	It is not known how inactive STP components were laidaway. Possible UST at 20-15. Two transformers are present in this section.
L21	Group 23	All or part of this section is within the missile damage radius from a 1942 accident at Group 2 involving M1 anti-tank mines. UXO clearance has not been verified. Buildings 23-31A and 61-7 are classified as XXX. Field observations indicate that a small caliber weapon firing may have been located adjacent to 61-39. Building 61-7 was used for demilitarization activities. Monitoring and maintenance of sanitary landfill must be conducted in accordance with closure requirements. Tetryl contaminated clothing was disposed of in landfill. A UST was found at 24-1 and an additional tank may be present at 61 11. There are three ASTs, 17 transformers, and three septic tanks in this section. Two former chemistry laboratories have been identified in this area.
L22	Group 25	There are three transformers and two septic tanks in this section.
L23	Group 27	Four of the buildings in this section were used to store items potentially contaminated with explosives. These buildings do not have explosive classifications. There is a septic tank in this section. Drums marked "1X" are present in one of the buildings in the group. Explosive contaminated drums were stored outside of the buildings in the group. Area L23a is still being investigated under IRP. Soil beneath the transformer in 27-5 may be contaminated with PCBs. There is a septic tank in this section. Darkly stained ballast is present in small section of RR right of way. Spent sand blast sand was spread on east side of section.
L24	Group 29	None.
L25	Group 62	Four ASTs, a drum of ferric chloride, and 17 transformers are present in this section. Some elevated radon levels were found here. Contaminated propellant drums were stored in this group.
L26	Group 63	Two septic tanks are present. Some elevated radon levels were found in this section. PCBs were stored in this group.
L27	Group 64	Several buildings in this Group are designated XXX. The buildings must be re-classified or decontaminated to 5X prior to transfer. Material has accumulated in floor level vents. Seven transformers and six septic tanks are present. Paint chips on soil near buildings contained high levels of lead and chromium. Alliant stored depleted uranium projectiles in this group.
L28	Group 65	Several buildings in this Group are designated XXX. Buildings must be re-classified or decontaminated to 5X prior to transfer. Buildings here are currently used for munitions storage. Two septic tanks are present. Flammable storage locker at 65-34.
L29	Group 66	Eighteen buildings in this Group are designated XXX. The buildings must be re-classified or decontaminated to 5X prior to transfer. A transformer and two septic tanks are present. Some radon levels exceed USEPA action levels. PCBs were stored here.

TABLE 5-1
SUMMARY OF FINDINGS BY SECTION
JOAAP, WILL COUNTY, ILLINOIS

Section Number	Description	Findings
L29	Group 66	Finished munitions were stored outside on pads in this group.
L30	Group 66A	Some radon levels in this area exceeded USEPA action levels.
L31	Extraction Pits	Buildings 9-31 and 9-32 are classified as XXX. Buildings must be re-classified or decontaminated to 5X prior to transfer.
L34	Former Burning Area	All or part of this section is within the missile damage radius from a 1942 accident at Group 2 involving M1 anti-tank mines. UXO clearance has not been verified. There is little information on the burning that has taken place here since the 1940s. Numerous ceramic mine components were observed in this area. Field tests indicate explosive residues may be present on thes components.
L35	Fill Area	None.
L100	PAS Survey Section 100	Two ASTs, three transformers and possibly a septic tank are present. Cattle deaths in this area resulted from application of pesticides in 1962.
L101	PAS Survey Section 101	None.
L102	PAS Survey Section 102	There is a septic tank present is this section.
L103	PAS Survey Section 103	The North LAP Electrical Substation is located here. No PCB sampling has been conducted.
L104	PAS Survey Section 104	None.
L105	PAS Survey Section 105	Two septic tanks are present here.
L106	PAS Survey Section 106	Two areas with intermeshed pits are present in this section.
L107	PAS Survey Section 107	All or part of this section is within the missile damage radius from a 1942 accident at Group 2 involving M1 anti-tank mines. UXO clearance has not been verified. Three transformers are present in this section. Stains are present on railroad tracks. Sand blast sand was observed in soil beneath water tower. A pile of sand was also seen at a turn in the road to the tower.
L108	PAS Survey Section 108	All or part of this section is within the missile damage radius from a 1942 accident at Group 2 involving M1 anti-tank mines. UXO clearance has not been verified. A drum and residue was found in this area.
L109	PAS Survey Section 109	None.
L110	PAS Survey Section 110	Cattle deaths in this area resulted from application of pesticides in 1962.
L111	PAS Survey Section 111	Four transformers are present in this section.
L112	PAS Survey Section 112	Possible UST and septic tank are present. Five transformers are present. Group 45, former auxiliary fuse and booster area, is located in this section. No investigation has been done. An area of stressed vegetation was observed (could be due to cattle).
L113	PAS Survey Section 113	None.
L116	PAS Survey Section 116	All or part of this section is within the missile damage radius from a 1942 accident at Group 2 involving M1 anti-tank mines. UXO clearance has not been verified. An AST, a septic tank, and two transformers are present in this section. Area of debris possibly from 1942 explosion in Group 2.
L117	PAS Survey Section 117	All or part of this section is within the missile damage radius from a 1942 accident at Group 2 involving M1 anti-tank mines. UXO clearance has not been verified. An area of stressed vegetation was identified in this section.
L118	PAS Survey Section 118	All or part of this section is within the missile damage radius from a 1942 accident at Group 2 involving M1 anti-tank mines. UXO clearance has not been verified.

TABLE 5-1
SUMMARY OF FINDINGS BY SECTION
JOAAP, WILL COUNTY, ILLINOIS

Section Number	Description	Findings
L118	PAS Survey Section 118	Two ASTs, five transformers, and two septic tanks are present in this section. A waste acid disposal pit is suspected at building 64-35. Sand blast grit and an oil stain were observed beneath water tower.
L119	PAS Survey Section 119	A transformer and AST are present. Holding pond receives runoff from Group 1 and Test Site. High barium levels in sediment.
L120	PAS Survey Section 120	A transformer is present.
L121	PAS Survey Section 121	Group 28 - a former pistol range may have lead in the soil backstop. Dredge spoils from Doyle Lake were spread on this section.
M99	TNT Block Area	As this area has a high probability of contamination it has been redesignated M6A and is included as part of IR site M6. One transformer is present here. Several dead animals were observed in a wooden junction box.
M100	PAS Survey Section 100	Surface water run-on from adjacent Mobil Oil Refinery.
M101	PAS Survey Section 101	Clay pipe (possibly discharge from MFG) was observed in Jackson Creek.
M102	PAS Survey Section 102	Eight transformers, three ASTs, and a septic tank are present. Elevated radon levels were found in some buildings. Possible presence of lead water pipes in Brown Circle.
M105	PAS Survey Section 105	A lessee reports the presence of green deposits. Eleven transformers are present. A UST may be present south of Building 814. Low levels of explosives have been detected in groundwater.
M106	PAS Survey Section 106	One transformer is present. Low levels of explosives have been detected in groundwater.
M107	PAS Survey Section 107	A sodium and sulfite groundwater plume from M2 extends into this section.
M108	PAS Survey Section 108	Several buildings in this Group are designated XXX. The buildings must be re-classified or decontaminated to 5X prior to transfer. There are 25 transformers, 16 electrical switches, and stained soils present. A UST may be present south of M7. Three ASTs and three septic tanks are present. Possible oil/water separator at 718-2. Elevated radon levels in some buildings. Explosives were swept from small rail cars on the spur to 718-2.
M109	PAS Survey Section 109	Two transformers and an AST are present. Three liquid filled drums were observed near a barn.
M110	PAS Survey Section 110	A transformer is present.
M111	PAS Survey Section 111	Several buildings in this Group are designated XXX. The buildings must be re-classified or decontaminated to 5X prior to transfer. Six transformers are present and a septic tank may be present in this section. Yellow crystals were present along tracks near M1.
M112	PAS Survey Section 112	A large pond with white deposits around it was found here. A sodium and sulfite groundwater plume from M1 extends into this section. Explosives and metals have been detected in surface water in this section.
M113	PAS Survey Section 113	A sodium and sulfite groundwater plume from M1 extends into this section. Low levels of explosives have been detected in groundwater in this section.
M114	PAS Survey Section 114	None.

6.0 BIBLIOGRAPHY

AAMC01 U.S. Army Armament, Munitions and Chemical Command, 1987. Installation Profile, Joliet Army Ammunition Plant, March 31.

AAMC02 U.S. Army Armament, Munitions and Chemical Command, 1987. Installation Profile, Joliet Army Ammunition Plant, September 30.

AAMC03 U.S. Army Armament, Munitions and Chemical Command, 1990. Installation Profile, Joliet Army Ammunition Plant.

AAMC04 U.S. Army Armament, Material Readiness Command, 1982. Army Ammunition Plant Profile Joliet Army Ammunition Plant. September 30.

ACOE01 U.S. Army Corps of Engineers, Louisville District, 1993. Environmental Assessment, Proposed Change from Inactive - Maintained to Inactive - Modified Caretaker Status, Joliet Army Ammunition Plant, Joliet Illinois, March.

ACOE02 U.S. Army Corps of Engineers, Omaha District, 1989, Investigation and Evaluation of Underground Storage Tanks, prepared for Department of the Army, Corps of Engineers, Huntsville Division, Huntsville, Alabama. September.

ACOE03 U.S. Army Corps of Engineers, Huntsville Division, 1986. Army Material Command (AMC) Environmental Compliance Audit Program, Audit Report. Joliet Army Ammunition Plant (JOAAP), Joliet, Illinois. October.

ACOE04 U.S. Army Corps of Engineers, Huntsville Division, 1986. Army Material Command (AMC) Environmental Compliance Audit Program, Audit Report Joliet Army Ammunition Plant (JOAAP), Joliet Illinois. June.

ACOE05 U.S. Army Corps of Engineers, Louisville District, 1995. Department of the Army Permit to Other Federal Government Department or Agency to Use Property Located on Joliet Army Ammunition Plant, Illinois. May 15.

ACOE06 U.S. Army Corps of Engineers, Chicago District. Master Plan Phase II: Analysis of Existing Facilities, Joliet Arsenal.

ACTS01 Beaver, Janet, 1996. Fax to Geoff Carton. Subject: Records from Army Compliance Tracking System. March 27.

AEHA01 U.S. Army Environmental Hygiene Agency, 1975. Water Quality Geohydrologic Consultation Number 24-002-76 Joliet Army Ammunition Plant, Joliet, Illinois. 8-12 September.

AEHA02 U.S. Army Environmental Hygiene Agency, 1972. Water Quality Engineering Special Study Number 24-032-72/73 Diatom and Macroinvertebrate Diversity as Indicators of the Impact of Army Ammunition Plant Waste Water Discharges on the Water Quality of Jackson and Grant Creeks, Joliet Army Ammunition Plant, Joliet, Illinois, 5-20 June.

AEHA03 U.S. Army Environmental Hygiene Agency, 1980. Landfill Permit Assistance Study Number 38-61-0178-81 Current Landfill Joliet Army Ammunition Plant, 1-16 December.

AEHA04 U.S. Army Environmental Hygiene Agency, 1980. Air Pollution Abatement Survey Number 44-21-0176-80 Joliet Army Ammunition Plant Joliet, Illinois, January.

AEHA05 U.S. Army Environmental Hygiene Agency, 1992. Water Quality Consultation Number 31-24-GK09-92 Radon in Water Supplies, Joliet Army Ammunition Plant, Joliet Illinois, 1-4 June.

AEHA06 U.S. Army Environmental Hygiene Agency, 1989. Wastewater Management Consultation Number 32-24-0948-90 Storm Water Outfall Evaluations, Joliet Army Ammunition Plant, Joliet, Illinois, 16-23 May.

AEHA07 U.S. Army Environmental Hygiene Agency, 1990. Wastewater Management Consultation Number 32-24-0029-90 Storm Water Outfall Evaluations Joliet Army Ammunition Plant. Joliet, Illinois, 18-23 April.

AEHA08 U.S. Army Environmental Hygiene Agency, 1990. Environmental Noise Study Number 52-34-0638-91 Updated Environmental Noise Contours for AT-4 Tactical Weapons System Joliet Army Ammunition Plant, Joliet, Illinois. 26-30 November.

6.0 BIBLIOGRAPHY

AEHA09 U.S. Army Environmental Hygiene Agency, 1972. Water Quality Engineering Special Study Number 24-024-72/72 Wastewater Study, Joliet Army Ammunition Plant, Joliet, Illinois. 5-19 June.

AEHA10 U.S. Army Environmental Hygiene Agency, 1994. Final Ecological Risk Assessment, Volume I, Phase I, Joliet Army Ammunition Plant, Joliet, Illinois, November 1.

AEHA11 U.S. Army Environmental Hygiene Agency, 1994. Health Risk Assessment for Consumption of Deer Muscle and Liver from Joliet Army Ammunition Plant, Joliet, Illinois, June.

AEHA12 U.S. Army Environmental Hygiene Agency, 1987. Water Quality Engineering Consultation Number 31-66-0141-87. Treatment Alternatives for Radium Removal in Drinking Water, Joliet Army Ammunition Plant, Joliet Illinois (odd pages only) 23-25 February.

AEHA13 U.S. Army Environmental Hygiene Agency, 1972. Air Pollution Source Sampling Survey Number 21-0101-73 Joliet Army Ammunition Plant, Joliet, Illinois, 13-22 November.

AEHA14 U.S. Army Environmental Hygiene Agency, 1971. Industrial Hygiene Survey Number 35-008-72 Joliet Army Ammunition Plant, Joliet, Illinois, November 19.

AEHA15 U.S. Army Environmental Hygiene Agency, 1966. Pre-TNT Production Industrial Waste Survey Kankakee Unit, Joliet Army Ammunition Plant, Joliet, Illinois Project Number 5127E3-66/67. March 19.

AEHA16 U.S. Army Environmental Hygiene Agency, 1993. Groundwater Quality Survey Number 38-26-KV60-93, Preliminary Site Assessment of Joliet Training Area, Joliet, Illinois. July 14-15. (not JOAAP)

AEHA17 U.S. Army Environmental Hygiene Agency, 1972. Water Quality Monitoring and Installation Laboratory Consultation Visit Number 24-030-72/73, Joliet Army Ammunition Plant, Joliet, Illinois. 5-16 June.

AEST01 American Environmental Sciences and Technology, Inc. 1994. Joliet Army Ammunition Plant (JOAAP) Analysis of the Joliet Arsenal Infrastructure, Facility Assessment and Proposed Reuse Plan, prepared for the State of Illinois Department of Conservation. June.

ALSI01 Alliant Techsystems, Inc., 1994. Spill Prevention Control and Countermeasure Plan and Installation Spill Contingency for Joliet Army Ammunition Plant , February 25.

ALSI02 Alliant Techsystems Joliet LAP Facility, 1990. Environmental Baseline Study for the Installation of a Natural Gas Pipeline. November 8.

AMCI01 U.S. Army Materiel Command. 1965. AMC Installation and Activity Summary. September 1.

AMCI02 U.S. Army Materiel Command. 1966. AMC Installation and Activity Summary. June 30.

AMCI03 U.S. Army Materiel Command. 1967. AMC Installation and Activity Summary. June 30.

AMCI04 U.S. Army Materiel Command. 1968. AMC Installation and Activity Summary. June 30.

AMCI05 U.S. Army Materiel Command. 1969. AMC Installation and Activity Summary. June 30.

AMCI06 U.S. Army Materiel Command. 1970. AMC Installation and Activity Summary. June 30.

AMCI07 U.S. Army Materiel Command. 1971. AMC Installation and Activity Summary. June 30.

AMCI08 U.S. Army Materiel Command. 1972. AMC Installation and Activity Summary. June 30.

AMCI09 U.S. Army Materiel Command. 1975. AMC Installation and Activity Summary. April 1.

AMCI10 U.S. Army Armament Command. 1976. DARCOM Installation and Activity Summary. March 31.

AMCI11 U.S. Army Armament Command. 1977. DARCOM Installation and Activity Summary. March 31.

AMCI12 Kane, Kimberly L., US Army Corps of Engineers, 1995. Historic Context for the World War II Ordnance Department's Government-Owned Contractor-Operated (GOCO) Industrial Facilities, 1939-1945. Prepared for US Army Material Command Historic Context Series. October.

AMKI01 A.M. Kinney, Inc. 1978. Rehabilitation of Industrial Liquid Waste Treatment Facility Project 5782135 Joliet Army Ammunition Plant, In-Progress Review 60 Percent Submittal. February 15.

6.0 BIBLIOGRAPHY

ANLA01 Argonne National Laboratory, 1990. Land Resources Assessment and Management Plant for the Joliet Army Ammunition Plant, Joliet Illinois, prepared by ANL, Environmental Assessment and Information Sciences Division, prepared for US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland. May.

ANLA02 Argonne National Laboratory, 1986. Groundwater Flow Modeling and Evaluation Joliet Army Ammunition Plant, Joliet, Illinois, prepared by ANL, Energy and Environmental Systems Division, prepared for U.S. Army Toxic and Hazardous Materials Agency. September.

ANLA03 Argonne National Laboratory, 1991. Installation Restoration Program: Hydrologic Measurements with an Estimated Hydrologic Budget for the Joliet Army Ammunition Plant, Joliet, Illinois, prepared by ANL, Environmental Assessment and Information Sciences Division prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, July.

ANLA04 Argonne National Laboratory, 1992. Draft Final Test Plan for Field Evaluation of Plant Uptake of Explosives from Contaminated Soil at the Joliet Army Ammunition Plant, Joliet, Illinois, prepared by ANL, Energy Systems Division, Environmental Assessment and Information Sciences Division, prepared for U.S. Army and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland. September.

ANLA05 Argonne National Laboratory, 1992. Draft Final Safety Plan for Field Evaluation of Plant Uptake of Explosives from Contamination Soil at the Joliet Army Ammunition Plant, Joliet, Illinois prepared by ANL, Energy Systems Division, Environmental Assessment and Information Sciences Division, prepared for U.S. Army and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland. September.

ANLA06 Argonne National Laboratory, 1992. Test Plan for Soil Slurry-Sequencing Batch Reactor Pilot Scale Demonstration at Joliet Army Ammunition Plant, prepared by ANL, Environmental Research Division, prepared for U.S. Army and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, April.

ARMY01 U.S. Army, 1978. Installation Assessment of Joliet Army Ammunition Plant, Record Evaluation Report Number 128. prepared by the Office of the Project Manager for Chemical Demilitarization and Installation Restoration.

ATEC01 ATEC Associates, Inc., Environmental Consultants, 1994. IEPA 45-Day Report, prepared for U.S. Army Engineer District, Louisville Corps of Engineers Joliet Army Ammunition Plant Brown Circle Housing Area. April 7.

ATEC02 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 54. Delivery Order Q008. ATEC Project Number 21-04-93-00064. June 8.

ATEC03 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 72. Delivery Order Q008. ATEC Project Number 21-04-93-00064. June 8.

ATEC04 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 74. Delivery Order Q009. ATEC Project Number 21-04-93-00093. June 8.

ATEC05 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 75. Delivery Order Q008. ATEC Project Number 21-04-93-00064. June 8.

6.0 BIBLIOGRAPHY

ATEC06 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 89. Delivery Order Q008. ATEC Project Number 21-04-93-00064. June 8.

ATEC07 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 18. Delivery Order Q009. ATEC Project Number 21-04-93-00093. June 8.

ATEC08 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 103/104. Delivery Order Q008. ATEC Project Number 21-04-93-00064. June 8.

ATEC09 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 70. Delivery Order Q008. ATEC Project Number 21-04-93-00064. June 8.

ATEC10 ATEC Associates, Inc. Environmental Consultants, 1994. Underground Storage Tank Removal prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant Manufacturing Area Tank 68. Delivery Order Q009. ATEC Project Number 21-04-93-00093. June 8.

ATEC11 ATEC Associates, Inc. Environmental Consultants, 1994. Draft Report- Revision #1 Groundwater Sampling and Laboratory Analysis, Buildings 23-2,718 and 1181. prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant, Joliet, Illinois. Delivery Order Number Q008. ATEC Project Number 21-04-93-00064. September 21.

ATEC12 ATEC Associates, Inc. Environmental Consultants, 1994. Aboveground Storage Tank Spill Response prepared for U.S. Army Corps of Engineers Contract Number DACA27-92-D-0027. Joliet Army Ammunition Plant L.A.P. Area Wilmington, Illinois. Delivery Number Q009 ATEC Project Number 21-04-94-00017. September 7.

ATEC13 ATEC Associates, Inc. 1994. IEPA 45-Day Report Joliet Army Ammunition Plant. April 7.

BACI01 Pavlick, Jr., Albert, Vice President Barium and Chemicals, Inc. 1986. Memorandum to Bernie A. Kavanaugh, Senior Engineer, Uniroyal Chemical Company, Inc. August 1.

BACL01 Battelle Columbus Laboratories, 1967. Aquatic Life Field Studies at Joliet Army Ammunition Plant, submitted to U.S. Army Medical Research and Development Command, Washington, DC., December 10.

BAWA01 Blank and Wesselink & Associates, 1977. Concept Design Analysis for Joliet Army Ammo Plant (Elwood Unit) Joliet, Illinois FY 77 MCA Project Number 971.140 Contaminated Waste Incinerator. June.

BEST01 Best Environmental, Inc. 1993. 45 Day Report of Leaking Underground Storage Tank at Joliet Army Ammunition Plant, Joliet, Illinois. October.

BEST02 Best Environmental, Inc. 1993. Final Report Underground Storage Tank Removal, Joliet Army Ammunition Plant. February.

BEST10 Best Group, Inc. 1996. Incident Reports - Contamination. May 8.

BICO01 Bionetics Corporation, 1986, Comprehensive Summary Report, Joliet Army Ammunition Plant, Joliet Illinois, Volume 1, prepared for US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland under Interagency Agreement Number RW-21930148-01.

BILL01 Weller, Jerry, Member of Congress, 1995. Bill to Establish the Midewin National Tallgrass Prairie in the State of Illinois. January 24.

6.0 BIBLIOGRAPHY

BILL02 unknown, 1995. Discussion Draft Title XXIX-Land Conveyances Involving Joliet Army Ammunition Plant. October 14.

BRAN01 Brandenburg, 1991. Brandenburg Binder for UST Removal. July 24.

CDKI01 Camp Dresser & McKee, Inc. 1990. Addendum to JOAAP Environmental Baseline Study for Talley Defense Systems, February 20.

CDKI02 Camp Dresser & McKee, Inc. 1988. Work Plan for Environmental Baseline Survey JOAAP Base Burn Project, Joliet, Illinois prepared for Talley Defense Systems, December.

CHPM01 U.S. Army Center for Health Promotion and Preventive Medicine, 1995. Final Supplemental Phase I, Ecological Risk Assessment Number 39-26-1420-95, Development of Preliminary Remediation Goals for Protection of the Upland Sandpiper Species, Joliet Army Ammunition Plant, Illinois. August.

CHPM02 U.S. Army Center for Health Promotion and Preventive Medicine, 1996. Memorandum for Commander U.S. Army Environmental Center, ATTN. Janet Beavers. Subject: Summary of the Ecological Risk Assessment Programs at Joliet Army Ammunition Plant (JOAAP), Illinois. February 6.

CHPP01 U.S. Army Center for Health Promotion and Preventive Medicine. 1993. Draft Phase 2 Aquatic Ecological Risk Assessment Number 39-26-LF23-93 Joliet Army Ammunition Plant Joliet, Illinois, 14-17 June.

CODE01 Will County Health Department, 1996. Will County Sewage Treatment and Disposal Ordinance. March 19.

CTAC01 Consoer, Townsend and Associates Consulting Engineers, 1973. Final Design Analysis LAP Industrial Waste Treatment -- WPC FY-72 Army Ammunition Plant Joliet, Illinois prepared for U.S. Army Engineer District, Omaha Corps of Engineers, Omaha, Nebraska. August.

DAMO01 Dames & Moore, 1986, Midwest Site Confirmatory Survey Assessment Report for Joliet Army Ammunition Plant, prepared for US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, November 26.

DAMO02 Dames & Moore, 1988. Assessment Report Proposed Excess Parcel, Manufacturing Area, Joliet Army Ammunition Plant, Illinois, prepared for Commander, US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, October 11.

DAMO03 Dames & Moore, 1989. Final Report, Assessment Report, PCB Spill Area, Group 70, Load-Assembly-Package (LAP) Area, Joliet Army Ammunition Plant, Joliet Illinois, prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland February 22.

DAMO04 Dames & Moore, 1990 Final, Phase 1 Results Report, Remedial Investigation Manufacturing (MFG) Area, Joliet Army Ammunition Plant, Joliet Illinois, Volume 1 of 2, prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland September 18.

DAMO05 Dames & Moore, 1993. Final Report, Phase 2 Remedial Investigation, Manufacturing (MFG) Area, Joliet Army Ammunition Plant, Joliet Illinois, Volume 1 of 2, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland May 30.

DAMO06 Dames & Moore, 1993. Final, Phase 1 Remedial Investigation Results Report, Load-Assembly-Package (LAP) Area, Joliet Army Ammunition Plant, Joliet Illinois, Volume 1 of 2, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, July 1.

DAMO07 Dames & Moore. 1991. Final Phase 1 Technical Plan. Part D: Health & Safety Plan; Remedial Investigation/Feasiblity Study, Load-Assemble-Package (LAP) Area, Joliet Army Ammunition Plant, Joliet, Illinois. March 6.

DAMO08 Dames & Moore. 1995. Determination of Class II Groundwater, Joliet Army Ammunition Plant, Joliet Illinois, (Draft) prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland . September 20.

DAMO09 Dames & Moore, 1993. Final Phase I Remedial Investigation Results Report, Load-Assemble-Package (LAP) Area Joliet Army Ammunition Plant, Appendix B, Prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland . July 1.

DAMO10 Dames & Moore, 1991. Final Phase I Technical Plan. Volume 1 of 3, Remedial Investigation/Feasibility Study Load- Assembly-Package (LAP) Area, Joliet Army Ammunition Plant, Joliet, Illinois prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland March 6.

DAMO11 Dames & Moore, 1994, Final Phase 2 Remedial Investigation, Load-Assemble-Package (LAP) Area Joliet Army Ammunition Plant, Joliet, Illinois, Volume 1 of 2 prepared for U.S. Army Environmental Center, December 5.

DAMO12 Dames & Moore, 1993. Final Report Phase 2 Remedial Investigation Manufacturing (MFG) Area Joliet Army Ammunition Plant, Joliet, Illinois prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland May 30.

DAMO13 Dames & Moore, 1994, Final Phase 2 Remedial Investigation, Load-Assemble-Package (LAP) Area Joliet Army Ammunition Plant, Joliet, Illinois, Volume 2 of 2 prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland December 5.

DAMO14 Dames & Moore. 1988. Final Report Honeywell Lap Facility Group 3A and AT4-PVC Environmental Baseline Study, prepared for US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, May 6.

DAMO15 Dames & Moore, 1993. Final Technical Plan Oleum Remedial Investigation manufacturing Area Joliet Army Ammunition Plant Joliet Illinois, prepared for US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, January 5.

DAMO16 Dames & Moore. 1992. Final Well Survey Findings and Propose Sampling and Analysis Plan, prepared for US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, January 15.

DAMO17 Dames & Moore, 1986. Honeywell LAP Facility Proposed Burn Ground Environmental Baseline Study, Joliet, Illinois, September 9.

DAMO18 Dames & Moore, 1994. Final Technical Plan Oleum Plant Phase 2 Remedial Investigation Manufacturing Area, Joliet Army Ammunition Plant, Joliet, Illinois, November 21.

DAMO19 Dames & Moore, 1993. Draft Final Oleum Plant Remedial Investigation Addendum Number 1 to the Remedial Investigation/Feasibility Study Manufacturing (MFG) Area Joliet Army Ammunition Plant Joliet , Illinois, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. June 11.

DAMO20 Dames & Moore, 1995. Final Addendum 1 Technical Plan Oleum Plant Phase 2 Remedial Investigation Manufacturing (MFG) Area Joliet Army Ammunition Plant Joliet , Illinois, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. August 2.

DAMO21 Dames & Moore, 1993. Draft Addendum Number 1 to the Remedial Investigation Manufacturing (MFG) Area Joliet Army Ammunition Plant Joliet , Illinois, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, April 5.

DAMO22 Dames & Moore, 1995. Draft Feasibility Study Groundwater Operable Unit, Load-Assemble-Package (LAP) Area Joliet Army Ammunition Plant, Joliet, Illinois, prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January 31.

DAMO23 Dames & Moore, 1995. Draft Final Baseline Risk Assessment Load-Assemble-Package (LAP) Area Joliet Army Ammunition Plant, Joliet, Illinois prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, February 3.

DAMO24 Dames & Moore, 1995. final Waste Classification/Volume Estimation Plan Manufacturing (MFG) Area, Joliet Army Ammunition Plant, Joliet, Illinois prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. June 29.

DAMO25 Dames & Moore, 1995. final Waste Classification/Volume Estimation Plan Load-Assemble-Package (LAP)) Area, Joliet Army Ammunition Plant, Joliet, Illinois prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. June 29.

DAMO26 Dames & Moore, 1994. Revised Draft Final Baseline Risk Assessment Manufacturing (MFG) Area Joliet Army Ammunition Plant, Joliet, Illinois prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, February 16.

DAMO27 Dames & Moore, 1991. Revised Final Phase 2 Statement of Work Part D: Health and Safety Plan Remedial Investigation of the Manufacturing Area, Joliet Army Ammunition Plant, prepared for US. Army Toxic and Hazardous Materiel Agency, Aberdeen Proving Ground, Maryland, April 22.

DAMO28 Wiek, Lois, Dames & Moore Washington Office, 1996. Fax to Jeff Thielker. Subject: List of Remedial Units for the LAP side of JOAAP. March 27.

DAMO29 McClelland, Scott, Project Manager Dames & Moore, 1996. Memorandum to Janet Beavers, U.S.Army Environmental Center. Subject: No Further Action Sites JOAAP. April 17.

DAMO30 Dames & Moore, 1996. Prepared for the US Army Environmental Center. Draft Oleum Plant Remedial Investigation Addendum No. 1 to the Phase 2 Remedial Investigation and Baseline Risk Assessment Manufacturing Area Joliet Army Ammunition Plant, Joliet, Illinois. Contract No. DAAA15-90-D-0015 Task Order No. 6. July 3.

DAMO31 Dames & Moore, 1996. Prepared for the US Army Environmental Center. Final Oleum Plant Remedial Investigation Addendum No. 1 to the Phase 2 Remedial Investigation and Baseline Risk Assessment Manufacturing Area Joliet Army Ammunition Plant, Joliet, Illinois. Contract No. DAAA15-90-D-0015 Task Order No. 6. September 4.

DAMO32 McClelland, Scott, Project Manager Dames & Moore, 1995. Memorandum to Janet Beavers, US Army Environmental Center. Subject: Production Wells at the Joliet Army Ammunition Plant. April 25.

DEDW01 Edwards, Dominque. 1994. BRAC Environmental Symposium. (presentation slides). December 14, 1994.

DISP01 Joliet Army Ammunition Plant. 1972. Request for Approval of Disposal of Buildings and Improvements. Building Number 855-1 through 855-5. August 29.

DISP02 Joliet Army Ammunition Plant. 1972. Request for Approval of Disposal of Buildings and Improvements. Building Number 855-6. August 22.

DISP03 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 704-16. May 4.

DISP04 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 707-15. October 12.

DISP05 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 721-5 October 12.

DISP06 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 722-11. October 12.

DISP07 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 1206. October 12.

DISP08 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 1210. October 12.

DISP09 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 1219. October 12.

DISP10 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 1220. October 12.

DISP11 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 1221. October 12.

DISP12 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 1223. October 12.

DISP13 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 1230. October 12.

DISP14 Joliet Army Ammunition Plant, 1973. Request for Approval of Disposal of Buildings and Improvements. Building Number 3-34. January 11.

DISP15 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 722-13. May 4.

DISP16 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Nos. 841-1 and 841-2. May 4.

DISP17 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 843. May 4.

DISP18 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Nos. 842-1 through 842-5. May 4.

DISP19 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 719. May 4.

DISP20 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 715-4. May 4.

DISP21 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 707-20. May 4.

DISP22 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 707-17. May 4.

DISP23 Joliet Army Ammunition Plant, 1979. Request for Approval of Disposal of Buildings and Improvements. Building Number 307-2. May 8.

DISP24 Joliet Army Ammunition Plant, 1978. Request for Approval of Disposal of Buildings and Improvements. Building Number TS-1266. November 14.

DISP25 Joliet Army Ammunition Plant, 1978. Request for Approval of Disposal of Buildings and Improvements. Building Number TS-1267. November 14.

DISP26 Joliet Army Ammunition Plant, 1978. Request for Approval of Disposal of Buildings and Improvements. Building Number TS-1265. November 14.

DISP27 Joliet Army Ammunition Plant, 1978. Request for Approval of Disposal of Buildings and Improvements. Building Number TS-1264. November 14.

DISP28 Joliet Army Ammunition Plant, 1978. Request for Approval of Disposal of Buildings and Improvements. Building Number TS-1263. November 13.

DISP29 Joliet Army Ammunition Plant, 1978. Request for Approval of Disposal of Buildings and Improvements. Building Number TS-1262. November 14.

DISP30 Joliet Army Ammunition Plant, 1979. Request for Approval of Disposal of Buildings and Improvements. Building Number 307-2. May 8.

DISP31 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 601-176. October 12.

DISP32 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 601-177A. October 12.

DISP33 Joliet Army Ammunition Plant, 1971. Request for Approval of Disposal of Buildings and Improvements. Building Number 704-15. October 12.

DJOH01 Doershuk, John F. 1987. Results of an Archaeological Reconnaissance of Lands Surrounding Mound 11-WI-241 at the Joliet Army Ammunition Plant, Will County, Illinois prepared for Illinois Historic Preservation Agency and the Department of Army, Corps of Engineers, Louisville District, July 1.

6.0 BIBLIOGRAPHY

DOAS01 Donohue & Associates, 1982, Geotechnical, Chemical, and Survey Data for Joliet Army Ammunition Plant (JOAAP), prepared for Joliet Army Ammunition Plant, Joliet Illinois, Monitoring Office, US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, August.

DOAS02 Donohue & Associates, 1982, Installation Restoration Surveys, Joliet Army Ammunition Plant (JOAAP), final Technical Report, Volume 2 of 2, prepared for Joliet Army Ammunition Plant, Joliet Illinois, Monitoring Office, US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, November 10.

DOAS03 Donohue & Associates, 1982. Installation Restoration Surveys, Joliet Army Ammunition Plant (JOAAP), final Technical Report, Volume 1 of 2, prepared for Joliet Army Ammunition Plant, Joliet Illinois, Monitoring Office, US. Army Toxic and Hazardous Materiel Agency, Aberdeen Proving Ground, Maryland, November 10.

DOAS04 Donohue & Associates, 1983, Joliet Army Ammunition Plant, Phase II, Geotechnical, Chemical, and Survey Data, prepared for Joliet Army Ammunition Plant, Joliet Illinois, Monitoring Office, US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, August.

DOAS05 Donohue & Associates, 1983, Joliet Army Ammunition Plant, Phase II, Technical Report Excessing Parcels, prepared for Joliet Army Ammunition Plant, Joliet Illinois, Monitoring Office, US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, August.

DOAS06 Donohue & Associates, 1983, Joliet Army Ammunition Plant, Phase II, Technical Report TNT Ditch Complex, Red Water Area, Explosive Burning Grounds, and Group 61, prepared for Joliet Army Ammunition Plant, Joliet Illinois, Monitoring Office, US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland ,August.

DOAS07 Donohue & Associates, 1985. Red Water Lagoon Sampling and Analysis Remedial Action, Final Report, Volume 1 of 3, Prepared for Joliet Army Ammunition Plant, Joliet, Illinois, Monitoring Office, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, October.

DOAS08 Donohue & Associates, Inc. 1982. Installation Restoration Surveys Joliet Army Ammunition Plant Contamination Analyses Report prepared for Joliet Army Ammunition Plant, Joliet, Illinois U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland. May 25.

DOAS09 Donohue and Associates, Inc. 1981. Geotechnical Report for Joliet Army Ammunition Plant (JOAAP) prepared for Uniroyal. May 22.

DOTA01 Thompson, Douglas J., Commander's Representative, Department of the Army, 1984. Memorandum to the Director of the State of Illinois Department of Labor. Subject: Toxic Substance Disclosure to Employee Act. June 25.

DOTA02 Erdman, Thomas L., Department of the Army Engineer, 1993. Letter to Hope Wright, Manager, Reporting and Financing Assurance Unit. Subject: 1992 Hazardous Waste Report. April 13.

DOTA03 Erdman, Thomas L., Department of the Army Engineer, 1986. Letter to James K. Frakes, Joliet LAP Facility. Subject: PCB Transformers- Honeywell, Inc. January 6.

DOTA04 Kaddatz, John C., Department of the Army Contracting Officer, 1994. Letter to Mr. Robin Rockney, Contract Manager, Alliant Techsystems, Inc. Subject: Implementation of the Storm Water Pollution Prevention Plan. December 21.

DOTA05 U.S. Army Environmental Center, 1994. Base Closure Technical Fact Sheets. September 30.

DOTA06 Joyce, Brendan E., Director, Laboratory Services Department of the Army, 1978. Letter to Commander at Joliet Army Ammunition Plant. Subject: Chemical Analysis of Doyle Lake Sediment. December 15.

DOTA07 Erdman, T.J., Engineer, Department of the Army, 1991. Memorandum for Distribution B. to Mr. N.A. Desmarais, Plant Manager. Subject: Final Review - AMC HAZMIN Progress Report. April 12.

DOTA08 Thompson, Douglas J., Commander's Representative, 1985. Memorandum to Mr. Rama K. Chaturvedi, Manager at Illinois EPA. Subject: Joliet/JOAAP/Will County ILD 7213820460, Closure and Post Closure, Explosive Burning Grounds. February 25.

DOTA09 Erdman, T.J., 1993. Memorandum to Plant Manager at Uniroyal, Inc. Subject: RCRA Inspection. August 5.

DOTA10 Department of the Army, 1993. Memorandum to Plant Manager of Uniroyal Chemical Company. Subject: Removal of Underground Storage Tanks (UST's). September 27.

DOTA11 Department of the Army, Army Environmental Health Laboratory, 1949. Report of Industrial Hygiene Survey. July 6.

DOTA12 Department of the Army, Army Environmental Health Laboratory, 1950. Report of Industrial Hygiene Survey. September 21.

DOTA13 Department of the Army, Army Environmental Health Laboratory, 1953. Industrial Hygiene Survey Number 1307S357-52. January 8-14.

DOTA14 Department of the Army, Army Environmental Health Laboratory, 1954. Report of Industrial Hygiene Survey Number 1768S101-54. October 21.

DOTA15 Department of the Army, Army Environmental Health Laboratory, 1956. Industrial Hygiene Survey Number 2222S242-55, Joliet Arsenal. June 27-July 6.

DOTA16 Department of the Army, Army Environmental Health Laboratory, 1957. Industrial Hygiene Survey Number 2795890-57, Joliet Arsenal (Elwood Unit). November 4-7.

DOTA17 Department of the Army, Army Environmental Health Laboratory, 1961. Industrial Hygiene Survey Number 3864S48-61/62. July 24-25.

DOTA18 Department of the Army, Army Environmental Health Laboratory, 1963. Industrial Hygiene Survey Number 4526B14-64. September 3-4.

DOTA19 Department of the Army, Army Environmental Health Laboratory, 1978. Industrial Hygiene Survey Number 66-0249-78. April 20.

DOTA20 Yates, Nancy, Department of the Army, 1996. Fax to Geoff Carton. Subject: Uniform Hazardous Waste Manifest. March 28.

DOTA21 Lappin, Don E., Chief, General Law/Congressional Affairs Divisions Department of the Army, 1991. Memorandum to Commander U.S. Army Materiel Command. Subject: CWA Citizen Suit Notice to Joliet Army Ammunition Plant. December 12.

DOTA22 Department of the Army Armament Command, 1975. Environmental Impact Assessment Joliet Army Ammunition Plant. September 11.

DOTA23 Department of the Army, Army Procurement & Supply Agency, 1972. Environmental Impact Assessment Joliet Army Ammunition Plant. September 7.

DOTA24 Department of the Army, 1978. Environmental Pollution Control Proposed Project Report. May 19.

DOTA25 Bishop, Ronald M., CPT, MSC Sanitary Engineer Industrial Hygiene Division Department of the Army, 1971. Memorandum to Robert E. Cunifff, Plant Manager Uniroyal Inc. Subject: Preliminary Report, Industrial Hygiene Survey Number 23-0008-72, Joliet Army Ammunition Plant, Joliet , Illinois, 8-19 November 71. December 2.

DOTA26 Gilley, William F., COL, MSC Director, Environmental Safety Department of the Army, 1975. Memorandum to Commander US Army Materiel Command. Subject: Corrections to Water Quality Monitoring Consultation Visit Number 24-030-72/73, Joliet Army Ammunition Plant, Joliet, Illinois, 5-16 June 1972. April 15.

6.0 BIBLIOGRAPHY

DOTA27 Holz, Arthur M., Environmental Coordinator, US Department of the Army, 1996. Memorandum to Jeff Carton, Plexus Scientific. Subject: Summary Reports Regarding the Explosive Reclassification of Storage Magazines Involved in the USDA Land Transfer. October 2.

ECOS01 Ecological Services. 1995. Native Vegetation at the Joliet Army Ammunition Plant and Joliet Training Area prepared for the Illinois Department of Conservation. June.

EDII01 Environmental Design International, Inc. 1994, Closure Documentation Report RCRA Closure for Magazines 66-86, 66-87 and 66-88, Joliet Army Ammunition Plant, prepared for the Department of the Army Joliet Army Ammunition Plant. September 28.

EETC01 Energy & Environmental Technology Company, 1995. Final Report Waste Stream Analysis at Joliet Army Ammunition Plant, Joliet, Illinois. September 13.

ENEA01 Sanders & Thomas, Inc., 1982. U.S. Army Armament Command Final Submission Executive Summary Joliet Army Ammunition Plant Energy Engineering Analysis. Prepared for The Department of the Army. May 14.

ENEA02 Sanders & Thomas, Inc., 1982. U.S. Army Armament Command Final Submission Appendix I, Joliet Army Ammunition Plant Energy Engineering Analysis. Prepared for The Department of the Army. May 14.

EPAV01 Environmental Protection Agency, Region V. 1989. Federal Facilities Agreement. May 19.

EPAV02 Environmental Protection Agency, 1989. National Priorities List Status Sheet and HRS Scoring Sheets for Load-Assemble-Package Area, March.

EPAV03 Muno, W.E. Chief RCRA Enforcement Section, 1986. Letter to Harry Burrus, Uniroyal, Inc. Subject : Notice of Violation. May 22.

EPAV04 Environmental Protection Agency, Region V. 1995. Inspection of Presumed Clean Study Areas at Joliet Army Ammunition Plant. October.

EPAV05 Harmon, Gary D., EPA Sanitary Engineer, 1970. Inspection of Sewage Treatment Facilities at Joliet Army Ammunition Plant. August 18.

EPAV06 Harmon, Gary D., EPA Sanitary Engineer, 1970. Inspection of Sewage Treatment Facilities at Joliet Army Ammunition Plant. August 18.

EPAV07 Harmon, Gary D., EPA Sanitary Engineer, 1970. Inspection of Sewage Treatment Facilities at Joliet Army Ammunition Plant. August 18.

EPAV08 Bakowski, Edwin C., State of Illinois EPA Solid Waste Branch Manager, 1995. Letter to Thomas L. Erdman, Department of the Army. Subject: Certification of Closure. June 16.

EPAV09 Bechely, Kennith P., Northern Region Manager, 1983. Letter to John F. Nemanich, Commander's Representative Department of the Army. Subject: Letter concerning Red Water Received by EPA. March 30.

EPAV10 U.S. Environmental Protection Agency, 1993. EPA General Information Consolidated Permit Program, EPA Number IL 7213820460, Joliet Army Ammunition Plant. March 4.

EPAV11 U.S. Environmental Protection Agency, 1988. National Survey of Hazardous Waste Generators, Questionnaire GA General Facility Information. March 22.

EPAV12 U.S. Environmental Protection Agency, 1987. EPA General Information Consolidated Permit Program, EPA Number IL 02210090049, Joliet Army Ammunition Plant. February 17.

EPAV13 Muno, William, Chief RCRA Enforcement Section. Memorandum to Mr. Thomas Erdman, Commander's Representative Joliet Army Ammunition Plant. Subject: Finding of Non-Compliance.

EPAV14 Bowden, Robert J., Sr. Program Manager U.S. Environmental Protection Agency, 1996. Memorandum to Mr. Andrew Poppin, U.S. Army Industrial Operation Command. Subject: Electrical Switch Box Survey Joliet Army Ammunition Plant, January 22.

EPAV15 U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 1995. EPA Background Information: National Priorities List, Proposal Rule and Final Rule. September.

EPAV16 U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. July 4.

EPAV17 Holz, Art, 1996. Fax to Jeff Carton, Plexus Scientific Corporation. Re: Leaking Underground Storage Tanks, LPC #1971105028 -- Will County LUST Incident #933227. January 19.

EPAV18 Morton, D.B., Chief Bureau of Stream Pollution Control Illinois EPA, 1970. Memorandum to Mr. C. F. Ball, Jr., LTC, OrdC Commanding Officer. Subject: Joliet Army Ammunition Plant - Sewage Treatment Facilities, Inspection Notes. September 1.

EPAV19 Melito, Jerry, Chief Engineer, 1972. Memorandum to Robert E. Cunniff, Plant Manager Uniroyal, Inc. Subject: Report of the US Environmental Protection Agency of Waste Disposal Facilities at Federal Installations. May 23.

ETAI01 Engineering Technologies Associates, Inc., 1994. Environmental Quality Technology Development, Demonstration and Transfer Activities, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. April.

FAXX01 Beavers, J. 1995. Fax to Phil Rappa, Subject:: ECAS Review (JOAAP). January 12.

FIEL01 Plexus Scientific Corporation, 1995-96. Logbook for Field Reconnaissance for Joliet Army Ammunition Plant.

FIRE01 Uniroyal Chemical Company, Inc. 1974-79. Fire Reports.

GDEL01 Delaney, Gerald, Director, Environmental Quality, 1990. Memorandum to unknown. Subject: Baseline Risk Assessment, Joliet Army Ammunition Plant. January 18.

GEOC01 Geo-Centers, Inc. 1994. Toxicity Testing of Soil Samples From Joliet Army Ammunition Plant, IL, February, 1994.

HDRE01 HDR Engineering, Inc. 1994. Preliminary Site Investigation for Will County's Proposed Landfill Site, Joliet Army Ammunition Plant, Will County, Illinois, Site Investigation Report, January.

HDRE02 HDR Engineering, Inc. 1993. Preliminary Site Investigation for Will County's Proposed Landfill Site, Joliet Army Ammunition Plant, Will County, Illinois, Health and Safety Plan. September.

HDRE03 HDR Engineering, Inc. 1993. Preliminary Site Investigation for Will County's Proposed Landfill Site, Joliet Army Ammunition Plant, Will County, Illinois, Sampling and Analysis Plan. September.

HIST01 Joliet Army Ammunition Plant. 1967. Basic Unit History Joliet Army Ammunition Plant from Origin to 31 December 1967, December.

HIST02 Joliet Army Ammunition Plant, 1968. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. December 31.

HIST03 Uniroyal Chemical Company, Inc. 1968. Basic Unit History Joliet Army Ammunition Plant, December.

HIST04 Joliet Army Ammunition Plant, 1969. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. June 30.

HIST05 Uniroyal Chemical Company, Inc. 1971 Basic Unit History Joliet Army Ammunition Plant, December.

HIST06 Joliet Army Ammunition Plant, 1971. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. December 31.

HIST07 Uniroyal Chemical Company, Inc. 1973 Basic Unit History Joliet Army Ammunition Plant, December.

HIST08 Uniroyal Chemical Company, Inc. 1974. Basic Unit History Joliet Army Ammunition Plant, December.

HIST09 Joliet Army Ammunition Plant, 1974. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. December 31.

HIST10 Joliet Army Ammunition Plant, 1975. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. December 31.

HIST11 Uniroyal Chemical Company, Inc., 1975. Basic Unit History Joliet Army Ammunition Plant, December.

HIST12 Joliet Army Ammunition Plant, 1966. Joliet Army Ammunition Plant Annual Historical Report. 1 January through 31 December.

HIST13 Joliet Army Ammunition Plant, 1973. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. December 31.

HIST14 Uniroyal Chemical Company, Inc. 1970. Basic Unit History Joliet Army Ammunition Plant, December.

HIST15 Joliet Army Ammunition Plant, 1970. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. December 31.

HIST16 Uniroyal Chemical Company, Inc. 1972. Basic Unit History Joliet Army Ammunition Plant, December.

HIST17 Joliet Army Ammunition Plant, 1972. Annual Supplement to Basic Unit History of the Joliet Army Ammunition Plant. December 31.

HIST18 Elwood Ordnance Plant, Historical Record, Period through September 1942, September.

HIST19 U.S. Rubber Company, 1957. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period January 1, 1957 through June 30, 1957.

HIST20 U.S. Rubber Company, 1957. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period July 1, 1957 through December 31, 1957.

HIST21 U.S. Rubber Company, 1958. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period January 1, 1958 through June 30, 1958.

HIST22 U.S. Rubber Company, 1958. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period July 1, 1958 through December 31, 1958.

HIST23 U.S. Rubber Company, 1957. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period January 1, 1959 through June 30, 1959.

HIST24 U.S. Rubber Company, 1959. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period July 1, 1959 through December 31, 1959.

HIST25 U.S. Rubber Company, 1960. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period January 1, 1960 through June 30, 1960.

HIST26 U.S. Rubber Company, 1960. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period July 1, 1960 through December 31, 1960.

HIST27 U.S. Rubber Company, 1961. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period January 1, 1961 through June 30, 1961.

HIST28 U.S. Rubber Company, 1961. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period July 1, 1961 through December 31, 1961.

HIST29 U.S. Rubber Company, 1962. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period January 1, 1962 through June 30, 1962. (Chapter 4 only)

HIST30 U.S. Rubber Company, 1962. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period July 1, 1962 through December 31, 1962. (Chapter 4 only)

HIST31 U.S. Rubber Company, 1963. Historical Report Joliet Arsenal - Kankakee Unit Joliet, Illinois for the Period January 1, 1963 through June 30, 1963. (Chapter 4 only)

HIST32 Joliet Army Ammunition Plant, 1980. Annual Historical Review, Joliet Army Ammunition Plant. Fiscal Year 1980 1 Oct. 79 - 30 September 80

HIST33 Joliet Army Ammunition Plant, 1978. Annual Historical Review, Joliet Army Ammunition Plant. Fiscal Year 1977 1 Oct. 76 - 30 September 77. March 21.

HIST34 Joliet Army Ammunition Plant, 1979. Annual Historical Review, Joliet Army Ammunition Plant. Fiscal Year 1978 1 October 77 - 30 September 78. May 4

HIST35 Joliet Army Ammunition Plant, 1979. Annual Historical Review, Joliet Army Ammunition Plant. Fiscal Year 1979 1 October 78 - 30 September 79.

HIST36 Joliet Army Ammunition Plant, 1981. Annual Historical Review, Joliet Army Ammunition Plant. Fiscal Year 1981 1 October 80 - 30 September 81.

HIST37 Kankakee Ordnance Works, 1943. Supplement Number 1 to Original Historical Report Covering Period January 1, 1943 through March 31, 1943.

HIST38 Kankakee Ordnance Works, 1943. Supplement Number 1 to Original Historical Report Covering Period 1 April 1943 through 30 June, 1943.

HIST39 Kankakee Ordnance Works, 1943. Supplement Number 1 to Original Historical Report Covering Period 1 October 1943 through 31 December 1943.

HIST40 Kankakee Ordnance Works, 1942. Supplement Number 1 to Original Historical Report Covering Period July 1, 1942 through December 31, 1942.

HIST41 Kankakee Ordnance Works, 1944. Supplement Number 1 to Original Historical Report Covering Period 1 January 1944 through 31 March 1944.

HIST42 Kankakee Ordnance Works, 1943. Supplement Number 1 to Original Historical Report Covering Period 1 July 1943 through h 30 September 1943.

HIST43 United States Rubber Company, 1955. Historical Report Joliet Arsenal- Kankakee Unit, Joliet, Illinois. June 30.

HIST44 United States Rubber Company, 1955. Historical Report Joliet Arsenal- Kankakee Unit, Joliet, Illinois. December 31.

HIST45 United States Rubber Company, 1956. Historical Report Joliet Arsenal- Kankakee Unit, Joliet, Illinois. June 30.

HIST46 United States Rubber Company, 1956. Historical Report Joliet Arsenal- Kankakee Unit, Joliet, Illinois. December 31.

HIST47 United States Rubber Company, 1956. Historical Report Joliet Arsenal- Kankakee Unit, Joliet, Illinois. June 30

HIST48 United States Rubber Company, 1954. Historical Report Joliet Arsenal- Kankakee Unit, Joliet, Illinois. December 31.

HIST49 U.S. Rubber Company, 1955. Historical Report Joliet Arsenal - Kankakee Unit, Joliet, Illinois. June 30.

HIST50 Uniroyal Chemical Company, Inc. 1972. Basic Unit History Joliet Army Ammunition Plant. June 30.

HIST51 Elwood Ordnance Plant, 1942. Volume I Part 1 Basic History through 30 September 1942. September 30.

HIST52 Elwood Ordnance Plant, 1942. Volume I Part 2 History, 1 October 1942 through 31 December 1942. December 31.

HIST53 Elwood Ordnance Plant, 1943. Volume II History, 1 January 1943 through 31 March 19543. March 31.

HIST54 Elwood Ordnance Plant, 1943. Volume III History, 1 April 1943 through 30 June 1943. June 30.

HIST55 Elwood Ordnance Plant, 1944. Volume VII History, I April 1944 through 30 June 1944. June 30.

HIST56 Elwood Ordnance Plant, 1944. Volume VIII History, 1 July 1944 through 30 September 1944. September 30.

HIST57 Elwood Ordnance Plant, 1945. Volume X History, 1 January 1945 through 31 March 1945. March 31.

HIST58 Allman, R.M., 1942. Memorandum to Colonel Crosby Field. Subject: Report on cause of explosion Elwood Ordnance Plant, June 5, 1942. September 10.

HIST59 War Department Security & Intelligence Division, 1944. Memorandum. Subject: Fire and Explosion, Group 3, Elwood Ordnance Plant, Joliet, Illinois, 11 July 1944. July 31.

6.0 BIBLIOGRAPHY

HIST60 War Department Ordnance Department, 1946. Memorandum to Office of the Chief of Ordnance, Pentagon Building. Subject: Outdoor Storage of Ammunition in Igloo Area. December 16.

HOLM01 Holman, W., 1969. Letter to J. Wetherholt/ H. Hennard. Subject: Acid Spill (74,000 lbs) on December 19, 1969. December 23.

HYWL01 Jaska, James M., Environmental Management Manager, Honeywell, Inc. 1987. Letter to the Director, Illinois EPA. Subject: Honeywell Joliet LAP Facility, EPA ID Number IL0210090049. May 6.

HYWL02 Johnson, Jay E., Principle Environmental Engineer, Honeywell, Inc. 1987. Letter to the Director, Illinois EPA. Subject: Honeywell Joliet LAP Facility, EPA ID Number IL0210090049. May 11.

HYWL03 McHale, J., Honeywell, Inc. 1986. Interoffice Correspondence to D. Thomas. Subject: 12/2/86 Explosive Incident at Bldg. 8-9 (demil). December 3.

HYWL04 Honeywell, Inc. 1984. Safety Survey Report Joliet LAP Facility. March 6.

HYWL05 Fitzsimmons, James A., Radiation Management Engineer, 1987. Memorandum to Mr. Ralph Cardenuto, Commander AMCCOM. Subject: DA Permit Number P12-06-02. January 12.

HYWL06 Honeywell, Inc. 1985. Interoffice Correspondence. Subject: Forklift/Propellant Burn Incident at HJA Group 5 on 3 June 1985 (Preliminary Report). June 4.

HYWL07 Frakes, James K., Location Manager, Honeywell Inc. 1985. Memorandum to Douglas J. Thompson, Commander Representative Department of the Army. Subject: Input to IEPA Annual Report, Generator Annual Hazardous Waste Report. February 27.

HYWL08 Spotts, R.W., Location Manager Honeywell M&MO, 1990. Letter to the Director, Illinois EPA. Subject: Honeywell M&MO Joliet Facility, EPA ID Number 1970450040. August 2.

HYWL09 Honeywell, Inc. 1987. Environmental Assessment AT-4 (M136) Process Verification Capability, Honeywell Joliet LAP Facility. May.

IDOC01 Illinois Department of Conservation, Division of Natural Heritage, 1994, A Survey of the Endangered and Threatened Plant and Animal Species of the Joliet Training Area Will County, Illinois, March.

IEPA01 Illinois Environmental Protection Agency. 1993. NPDES Permit Number IL0002666 issued by the Illinois EPA Division of Water Pollution Control. September 22.

ILCA01 Subtitle D - Transfer of Jurisdiction and Establishment of Midewin National Tallgrass Prairie, cited as the Illinois Land Conservation Act of 1995.

INCR01 Uniroyal Chemical Company, Inc. 1971-79. Incident Reports: Leaks and Spills.

INCR02 Uniroyal Chemical Company, Inc. 1978. Incident Reports: Fires. October 31.

INET01 New Jersey Hazardous Substance Sheet for Octachloronaphthalene, CAS Number: 2234-13-1 (http://rtk.net/E1470T29). July 31.

INVN01 1991. Group 66 Designated Storage List. January 14.

JAAP01 Joliet Army Ammunition Plant, 1974. Spill Prevention Control and Countermeasure Plan for Joliet Army Ammunition Plant, August 15.

JAAP02 Joliet Army Ammunition Plant, 1976. Spill Prevention Control and Countermeasure Plan for Joliet Army Ammunition Plant, September 8.

JAAP03 Joliet Army Ammunition Plant, 1981. Spill Prevention Control and Countermeasure Plan for Joliet Army Ammunition Plant, March 26.

JAAP04 Joliet Army Ammunition Plant, 1983, Standard Operating Procedure for Demolition of Tetryl Buildings in Tetryl Area #1, August.

JAAP05 Joliet Army Ammunition Plant, 1986. Spill Prevention Control and Countermeasure Plan for Joliet Army Ammunition Plant, March 7.

JAAP07 Joliet Army Ammunition Plant, 1988. Spill Prevention Control and Countermeasure Plan for Joliet Army Ammunition Plant, June 21.

6.0 BIBLIOGRAPHY

JAAP08 Joliet Army Ammunition Plant, 1959. Master Plan; Phase II; Analysis of Existing Facilities, Joliet Arsenal - Kankakee Unit, Joliet, Illinois. July 1.

JAAP09 Joliet Army Ammunition Plant, 1964. Master Plan; Phase II; Analysis of Existing Facilities, Joliet Arsenal - Kankakee Unit, Joliet, Illinois, May 1.

JAAP10 Joliet Army Ammunition Plant, 1988. Building and Facility Information. July.

JAAP11 Joliet Army Ammunition Plant, Elwood Ordnance Plant, Group Layouts, Office of the Post Engineer, Joliet Arsenal.

JAAP12 Cropek, D. and Kemme, P.A. 1993. Environmental Assessment of Joliet Army Ammunition Plant Soil and Water Analysis, October 15.

JAAP13 Joliet Army Ammunition Plant, 1993. IRP Fact Sheet, prepared by Installation Restoration Division, U.S. Army Environmental Center, January.

JAAP14 Thompson, D.J. Commander's Representative. 1985. Letter to Kevin Pierard. U.S. EPA Region V. Subject: Red Water Lagoon Remedial Action. February 7.

JAAP15 Anderson, A.W. Chief, Assessments Division. 1985. Letter to Tom Erdman Commander's Representative JOAAP. Subject: Red Water Lagoon Remedial Action. January 30.

JAAP16 Zerboglio, R. Commander's Representative. 1995. Letter to Mr. Robert Bowden, Waste Management Division, EPA Region V. Subject: Conducting confirmatory screening for explosives at JOAAP. MAY 19.

JAAP17 Joliet Army Ammunition Plant. 1995. Memorandum to interested parties. Subject: Environmental Restoration Activities and RAB Formation. October 17.

JAAP18 McCasland, J.A., 1967. Memorandum to Hal Holz. Subject: Water Sample- Point Number 8. June 29.

JAAP19 Klover, W.J., Chemist Technician, 1967. Memorandum to V.J. Russo, Chief Chemical Engineer. Subject: White Turbidity in Acid Water. July 17.

JAAP20 Russo, V.J., Chief Chemical Engineer, 1967. Memorandum to Mr. L.A. Doherty. Subject: Pollution Complaint. August 3.

JAAP21 Bond, C.A., Chemical Engineer, 1967. Memorandum to V.J. Russo, Chief Chemical Engineer. Subject: Level Alarms for Acid Area Tanks. February 3.

JAAP22 Bond, C.A., Chemical Engineer, 1966. Memorandum to V.J. Russo, Chief Chemical Engineer. Subject: Red Water Catch Box Leakage. August 15.

JAAP23 Cromer, J.N., Chemical Engineer, 1966. Memorandum to V.J. Russo, Chief Chemical Engineer. Subject: Acid Spill in TNT #12 Line. July 5.

JAAP24 Vincini, J.J., Chemical Engineer, 1966. Memorandum to V.J. Russo, Chief Chemical Engineer. Subject: Dumping of T-Mix and Oleum from Line #9. June 20.

JAAP25 Hollowell, D.W., Chemical Engineer, 1966. Memorandum to V.J. Russo, Chief Chemical Engineer. Subject: TNT Acid Discharge. May 20.

JAAP26 Blanchard, Keith P., Sr. Chemical Engineer, 1968. Memorandum to Thurman Jones, Chief QAD. Subject: Oil on Prairie Creek. June 10.

JAAP27 Batke, J.B., 1967. Memorandum to V.J. Russo, Chief Chemical Engineer. Subject: Proposed Plan to Divert Acid #3 Effluent to Grant Creek. January 13.

JAAP28 Joliet Army Ammunition Plant, 1970. Lead Azide Layaway Procedure. January 23.

JAAP29 Joliet Army Ammunition Plant, 1969. Red Water Layaway Procedure. November 24.

JAAP30 Joliet Army Ammunition Plant, 1973. SOP for Demolition of TNT Block Pressing Facilities. September 13.

JAAP31 Spotts, R.W., SMU Manager, Alliant Techsystems, Inc., 1992. Letter to Don Snider, Specialized Safety Government Representative DCASR-CHI. Subject: Administrative Changes to Final Safety Review (FSR) for sludge drying operations in Group 5 at the Joliet Army Ammunition Plant. March 4.

JAAP32 Joliet Army Ammunition Plant, 1990. Incident Report for Explosive Trailer Fire, GRP 68 Igloo 15-LAP- Honeywell. July 23.

JAAP33 Patzer, S.C., Senior Technical Assistant, 1987. Memo for Record, Pesticide Inspection Checklist. April 20.

JAAP34 Inventory of North Power Materials.

JAAP35 Joliet Army Ammunition Plant, 1955. Report of Investigation Board, Railroad Accident North Classification Yard, Kankakee Unit, Joliet Arsenal. June 27.

JAAP36 Zerboglio, Bob, Joliet Army Ammunition Plant, 1994. List of Buildings to be Removed. December 21.

JAAP37 U.S. Environmental Protection Agency, 1989. Federal Facilities Agreement, JOAAP. May

JAAP38 Statutory Requirements, Illinois Water Well Construction Code. November 30.

JAAP39 Kimbrell, K.Diane and Snellgrove, Matthew, US Army Corps of Engineers, 1995. Joliet Army Ammunition Plant Supplemental Photographic Documentation of Archetypal Buildings, and Equipment for U.S. Army Material Command National Historic Context for World War II Ordnance Facilities. March.

JAAP40 Walsh, Rita and Wingo, Patricia, Gray & Pape, Inc. under US Army Corps of Engineers, 1995. The World War II Ordnance Department's Government-Owned Contractor-Operated (GOCO) Industrial Facilities, Joliet Army Ammunition Plant Historical Investigation. Prepared for US Army Material Command Historic Context Series. December.

JAAP41 Joliet Army Ammunition Plant, 1966. Building and Facility Information. May 1.

JAAP42 Cropek, D. and Kemme, P.A. 1991. Environmental Assessment of Joliet Army Ammunition Plant Red Water Analysis, August 22.

JAAP43 Cropek, D. and Kemme, P.A. 1991. Environmental Assessment of Joliet Army Ammunition Plant Soil and Water Analysis, December 20.

JAAP44 Cropek, D. and Kemme, P.A. 1992. Environmental Assessment of Joliet Army Ammunition Plant Soil and Water Analysis, April 25.

JAAP45 University of Illinois, 1990. JAAP Sampling Tracts 146 & 150. March 3.

JAAP49 1996. PAS Field Review Summary. July 26.

JAAP50 Baggett, W.K., Senior Supervisor Explosives/Analytical Quality Control Department, Uniroyal, Inc. 1970. Memorandum to R.E. Blaine. Subject: Quarterly Magazine Inspection Report. March 19.

JAAP53 Orlomoski, T.W., Surveillance Inspection Foreman Quality Control Department, 1970. Memorandum to W.K. Baggett, Senior Supervisor, Uniroyal Inc. Subject: DNT in Temporary Storage MFG Unit. March 13.

KOWS01 Kankakee Ordnance Works, 1944. War Department Industrial Facilities Inventory. June 1.

LEAS01 US Army Corps of Engineers, 1996. Military Outgrant Report. April 29.

LESQ01 Cantone, Karen, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ02 Hendrix, Larry, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ03 Rodriguez, Guadalupe, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ04 Lowery, Douglas R., 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ05 Graham, R. Joseph, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ06 Lowery, Michael T., 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ07 Phelan, Bill, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ08 Brown, Glenn, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ09 Bush, Ralph, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ10 Lauterbach, C. Edward, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ11 Moret, Ronald, 1996. Agricultural Lessee Questionnaire, Joliet Army Ammunition Plant, Joliet, Illinois. January 19.

LESQ12 Jackson, Keith, 1996. Response to Agricultural Lessee Questionnaire Joliet Army Ammunition Plant, Joliet, Illinois. January 18.

LESQ13 Jackson, Gerald, 1996. Agricultural Lessee Questionnaire Joliet Army Ammunition Plant, Joliet, Illinois. January 18.

LESQ14 Quigley, Richard, 1996. Agricultural Lessee Questionnaire Joliet Army Ammunition Plant, Joliet, Illinois. January 18.

LESQ15 Holz, Harold, 1996. Agricultural Lessee Questionnaire Joliet Army Ammunition Plant, Joliet, Illinois. January 18.

MAPS01 Dames & Moore. 1987. Wetland Area in the Vicinity of the Manufacturing Area, Joliet Army Ammunition Plant, Joliet, Illinois. Plate 4.

MAPS02 U.S Army Corps of Engineers, 1954. Master Plan Joliet Arsenal - Kankakee Unit, Sanitary Sewer Map. March 31.

MAPS03 Sanders and Porters Engineers and Contractors, 1942. Elwood Ordnance Plant, Plant Layout: Storm & Sanitary Sewers. Plan Number 100-78-13. February 11.

MAPS04 Uniroyal Chemical Company, Inc. 1967. Joliet Army Ammunition Plant Toluene Storage Farm. August 14-17.

MAPS05 Uniroyal Chemical Company, Inc. 1967. JOAAP Sellite Area Map Including Box Factory. August 4.

MAPS06 U.S. Army Corps of Engineers, 1964. Joliet Arsenal - Elwood Unit Master Plan Basic Information Maps 1-7. Scale 1:400. June

MAPS07 U.S. Army Corps of Engineers, 1964. Joliet Arsenal - Kankakee Unit Master Plan Basic Information Maps 1-6. Scale 1:400. June

MAPS08 Dames & Moore, 1995. U.S. Geological Survey, 7.5 minute series Topographic Quadrangle Maps of Illinois: Channahon 1973, Elwood 1975, Wilmington 1973, Symerton 1973. Scale 1:400. January 31.

MAPS09 Uniroyal, Inc. Joliet Army Ammunmition Plant Map - LAP Unit

MAPS10 U.S. Department of Agriculture, Soil Conservation Service, 1980. Soil Maps, Will County, Illinois.

MAPS11 Sanderson & Porter Engineers and Contractors, 1958. Elwood Ordnance Plant - Plant Layout. July 1.

MAPS12 Stone & Webster Engineer Corps, 1973. Joliet Arsenal Kankakee Unit - Plant Layout. July 23.

MEMO01 Holz, A. 1994. Management Agronomist. Memorandum for Commander, U.S. Army Environmental Center, ATTN.: SFIM-AEC-IRA (Mr. Zeisloft), Aberdeen Proving Ground, Maryland 21010-5401. Subject: Environmental Testing of Agricultural Land at Joliet Army Ammunition Plant. August 30.

MEMO02 LaFrenz, Kathy. 1994. AMC I&SA. Memorandum to Jamey Zeisloft, AEC, Subject: Information on chemicals found at Joliet Army Ammunition Plant. December 7.

MEMO03 Agy, E.C. 1991. Chief, Facilities Engineer Division. Memorandum for Commander's Representative, Joliet Army Ammunition Plant, ATTN.: SMJCO-OR, Joliet, IL 60436-5000 Subject: Environmental Baseline Study (EBS) for Agricultural Leases, Joliet Army Ammunition Plant. January 23.

MEMO04 Plexus Scientific Corporation, 1996. Record of Telephone Conversation from Geoffrey Carton. Subject: Telephone Conversation with Art Holz, JOAAP for clarification. January 25.

MEMO05 Carton, Geoffrey, Plexus Scientific, 1996. Telephone conversation with Tim McHale, Alliant Techsystems, Inc. Subject: Alliant operations and potential environmental concerns. March 19.

MEMO06 Carton, Geoffrey, Plexus Scientific, 1996. Telephone conversation with Ron Harman, Illinois EPA. Subject: Used wood products. March 21.

MEMO07 Carton, Geoffrey, Plexus Scientific, 1996. Telephone conversation with Art Holz, JOAAP. Subject: Cattle deaths in 1962. March 28.

MEMO08 Carton, Geoffrey, Plexus Scientific, 1996. Telephone conversation with Nancy Yates, JOAAP. Subject: Removal of propellant grains at 64-35 and STB and DS2 from Group 27. March 28.

MEMO09 Carton, Geoffrey, Plexus Scientific Corporation, 1996. Record of Telephone Conversation with Art Holz. Subject: JOAAP cornering outstanding questions. May 2.

MEMO10 Carton, Geoffrey, Plexus Scientific Corporation, 1996. Record of Telephone Conversation with Bob Bowden. Subject: USEPA concerning radiation survey at LAP area of JOAAP. May 1.

MEMO11 Carton, Geoffrey, Plexus Scientific Corporation, 1996. Record of Telephone Conversation with Bernie Caranough, former Uniroyal Environmental Coordinator. Subject: concerning activities at JOAAP. May 6.

MEMO12 Carton, Geoffrey, Plexus Scientific Corporation, 1996. Record of Telephone Conversation with Carl King, US Army Industrial Operations Command. Subject: concerning liquidation of personal property at JOAAP. May 3.

MEMO13 Carton, Geoffrey, Plexus Scientific Corporation, 1996. Record of Telephone Conversation with John Csikos, former Uniroyal employee. Subject: concerning activities at JOAAP. May 7.

MEMO14 Carton, Geoffrey, Plexus Scientific Corporation, 1996. Record of Telephone Conversation with Andrew Poppen, US Army Industrial Operations Command. Subject: concerning electrical switch gear box removal. May 8.

MEMO15 Stritch, Larry, 1995. Memorandum to Janet Beavers. Subject: JOAAP - Brown Circle Houses. September 18.

MEMO16 Carton, Geoffrey, Plexus Scientific Corporation, 1996. Phone Conversation Record with Albert Paavlik, President of Barium and Chemicals, Inc. Subject: Information on strontium peroxide and calcium resinate. May 17.

MEMO17 Guenzler, H.G., Acting Chief, Industrial Engineers Division, Department of the Army, 1970. Memorandum to Commanding Officer, Joliet Army Ammunition Plant. Subject: Open Burning of Propellants and Explosives. July 9.

MEMO18 Knight, T.L., Administrative Assistant, Uniroyal, Inc. 1970. Memorandum to C. Bond. Subject: Open Burning of Propellants and Explosives. August 7.

MEMO19 Bakowski, Edwin C., Manager, Permit Section Bureau of Land, Illinois Environmental Protection Agency, 1996. Memorandum to Geoffrey Carton. Subject: 9240019999 -- State of Maryland Plexus Scientific Corporation General Correspondence. July 9.

MEMO20 McHale, T., Alliant Techsystems, 1996. Memorandum to Geoff Carton. Subject: History of Alliant Techsystems/Honeywell Ammunition Manufacturing. July 30.

MEMO21 Roush, Deborah and Poppen, Andrew, 1996. EMail to Phil Rappa, Plexus Scientific. Subject: JAAP Underground Storage Tanks. June 20.

MHAR01 Harris, Michael, 1992. Memorandum to Barb Smiles, Land Use Department, Will County, Subject: Proposed Landfill Locations at Joliet Army Ammunition Plant Review of Dames & Moore Draft Phase I Site Investigation Report on the Load Assembly Package Area. October 15.

6.0 BIBLIOGRAPHY

MILR01 Miller, H.R., Safety Superintendent Uniroyal, Inc. 1981. Memorandum to Mr. John F. Nemanich, Contracting Officer's Representative. Subject: Inspection of Explosive Magazines 65-4 and 65-6. October 14.

MILR02 Miller, H.R., Safety Superintendent Uniroyal, Inc. 1982. Memorandum to Mr. John F. Nemanich, Contracting Officer's Representative. Subject: Inspection of Explosive Storage Igloos Assigned to the Treasury Department (BATF). May 5.

MILR03 Miller, H.R., Safety Superintendent Uniroyal, Inc. 1986. Memorandum to Mr. Douglas J. Thompson, Contracting Officer's Representative. Subject: Obsolete Chemicals for Disposal. May 28.

MJRY01 Reynolds, M.J. A History of the Joliet Army Ammunition Plant.

MSDS01 H-O-H Chemicals, Inc. 1994. Material Safety Data Sheet, Product C-461. January 1.

MSDS02 Calgon Vestal Laboratories, 1991. Material Safety Data Sheet, Scale Remover 828. December 16.

MSDS03 Calgon Corporation, 1994. Material Safety Data Sheet, Project Name: CL-14, MSDS Code: OH29. June 14.

MSDS04 U.S. Department of Labor, 1994. Material Safety Data Sheet, Identity: Spartan X-12. December 1.

MSDS05 U.S. Department of Labor. Material Safety Data Sheet, Identity: Composition B.

MSDS06 Diversey Corporation, 1992. Material Safety Data Sheet, Product Name: Dry Lite. August 20.

MUZZ01 Muzzarelli, Patricia L., Property Administrator Department of the Army, 1986. Memorandum to DPDO Navel Training Center. Subject: Obsolete Chemicals for Disposal. June 17.

MUZZ02 Muzzarelli, Patricia L., Property Administrator Department of the Army, 1986. Memorandum to Mr. N.A. Desmarais, Plant Manager, Uniroyal Chemical Company, Inc. Subject: Obsolete Chemicals. August 29.

NEWS01 Presecky, William, 1995. "Plan to convert arsenal ready to roll in Congress", Chicago Tribune. January 14.

NEWS02 Estiill, Bob, 1995. "Weller set to revive arsenal bill", Joliet Herald. January 14.

NEWS03 Estill, Bob, 1996. "Arsenal plan goes to president", The Herald News. January 27.

NEWS04 Garvey, Megan, 1996. "Old Arsenal to explode in grass", The Baltimore Sun. March 31.

NEWS05 Cotliar, Sharon, 1996. "Joliet Arsenal Site Could Hold Thousands of Jobs". May.

OHMC01 OHM Remediation Services Corporation. 1995. Final Field Screening Work Plan/Quality Assurance Project for Sampling and Analysis of Soils in SA Nos. 5 and 6 of the MFG. Joliet Army Ammunition Plant, Joliet, Illinois prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland June 28.

OHMC02 OHM Remediation Services Corporation. 1995. Feasibility Study Report for Operable Unit 1: Soils Containing Sulfur and Sulfate Joliet Army Ammunition Plant, Joliet, Illinois prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland March 2.

OHMC03 OHM Remediation Services Corp., 1995. Draft Final Feasibility Study Report Operable Unit 2, Operable Unit 4 and Operable Unit 6, Volume 1, prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. February.

OHMC04 OHM Remediation Services Corp., 1993. Draft Feasibility Study Report Operable Unit 5, prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. November.

OHMC05 OHM Remediation Services Corp., 1993. Draft Feasibility Study Report Operable Unit 2, prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. November.

OHMC06 Novak, R. P.E. Project Manager OHM Remediation Services. 1994. Letter to R.Snyder, U.S. Army Environmental Center. Subject: OHM Position Letter. July 11.

OHMC07 OHM Remediation Services Corp., 1993. Draft Feasibility Study Report Operable Unit 3, prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland October.

OHMC08 OHM Remediation Services Corp., 1996. Joliet Army Ammunition Plant Manufacturing (MFG) Area Load-Asssemble-Package (LAP) Area Will County, Illinois Preliminary Remediation Goals Final Report. Prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. April.

OHMC09 OHM Remediation Services Corp., 1996. Computation Sheet. Subject: RU Designation. May 9.

OHMC10 OHM Remediation Services Corp., 1996. Changes to the Study Area Boundaries. May 8.

PESI01 Penetryn System, Inc. 1979. Sewer System Analysis and Evaluation Joliet Army Ammunition Plant, Joliet, Illinois Report of Field Study for Sewer System Evaluation Survey, Volume 1 Summary and Conclusions. September.

PESI02 Penetryn System, Inc. 1979. Sewer System Analysis and Evaluation Joliet Army Ammunition Plant, Joliet, Illinois Report of Field Study for Sewer System Evaluation Survey, Volume 2 Manhole Investigation Reports. September.

PHOT01 U.S. Department of Agriculture, Natural Resources Conservation Service, 1961. Aerial Photos BXK - 4BB - 246 Will County, Illinois. August 30.

PHOT02 United States Department of Interior, Topographic Division, 1946. Geological Survey Aerographic Photographs, Project Number GS-CB, Photo: 9-82, 9-83, 10-86, 10-87, 10-124, 10-125, 10-148, 10-149, 10-150. Wilmington, Illinois. July 18, 22-23.

PHOT03 United States Department of Interior, Topographic Division, 1952. Geological Survey Aerographic Photographs, Project Number GS-UB, Photo: 1-61, 1-62, 1-64, 1-65, 2-4, 2-5, 2-6, 2-7, 2-8, 2-10, 2-11, 2-12, 2-46, 2-47, 2-48, 2-50, 2-52, 2-53, 2-54, 2-55. Wilmington, Illinois. April 7, 19.

PHOT04 unknown. Miscellaneous Aerogaphic Photographs.

PSCO01 Plexus Scientific Corporation. 1995. Draft Preliminary Assessment Screening, Proposed Veterans Administration Cemetery, Joliet Army Ammunition Plant, March.

PSCO02 Plexus Scientific Corporation. 1995. Community Relations Plan (Draft Final) Joliet Army Ammunition Plant, prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. October 26.

PSIN01 Professional Service Industries, Inc. Hillside. 1993. Prioritization Asbestos Assessment Study, prepared for Uniroyal Chemical Company, Inc.

PTHO01 Thomas, Pamela, Project Engineer 1994. Letter to Jamey Zeisloft. Subject: Preliminary Site Investigation for Will County Proposed Landfill Site (JOAAP). January 3.

RADO01 Bice, Carol, Housing Management Assistant, 1990. Memorandum to Terradex Radon Detection Products. Subject: Army Radon Reduction Program, Quality Assurance Program, Radon Detectors. April 25.

RADO02 Tech/Ops Landauer, Inc. 1990. Radon Monitoring Report. Acct. Number 0405251. May 30.

RBOW01 Bowden, R.J. Senior Program Manager, 1995. Letter to Janet Beavers, U.S. Army Environmental Center. Subject: Visual inspection of six areas containing bunkers at JOAAP. October 13.

RCUN01 Cuniff, R.E. Plant Manager. 1973. Letter to Willis S. Rosing, LTC, Contracting Officer's Representative. Subject: Procedure for Demolition of DNT Nitrating House. February 15.

RMIL01 Miller, Roy D., Chief, Water Quality Engineering Division, 1990. Memorandum for Commander, U.S. Army Material Command, Subject: Water Quality Consultation Number 31-24-0014-90, Radon in Water Supplies, Joliet Army Ammunition Plant, Joliet, Illinois, 4-7 December.

ROCK01 Rock Island Arsenal, 1995. Liquidation of Personal Property and Removal of Asbestos at Joliet Army Ammunition Plant. June 1, 1995.

RRCO01 Rome Research Corporation. 1979. Aerial Color Infrared Photography Interpretation, prepared for Joliet Army Ammunition Plant, Joliet Illinois.

RRCO02 Rome Research Corporation, 1980. Identification of Waste Disposal Sites and Contaminant Related Vegetation Stress through Aerial Color Infrared Photography Interpretation, prepared for US. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, January 31.

RYOR01 York, R.J. Acting Chief, Installation Restoration Division. 1989. Memorandum to Mr. Boquist, Mr. Tedell, Mr. Novak, U.S. Army Armament, Munitions and Chemical Command. Subject: Environmental Baseline Study, Group 2, Joliet Army Ammunition Plant. January 24.

SEGI01 Scientific Ecology Group, Inc. 1994. Alliant Techsystems Facilities Wilmington LAP Facility Remediation and Site Release Survey Plan, August.

SPED01 Sanders & Porters Engineering Department. Reference Folder of Group Layouts, Elwood Ordinance Plant, Joliet, Illinois.

SPIL01 Cuniff, R.E., Plant Manager Uniroyal, Inc. 1973. Memorandum to William S. Rosing, LTC Contracting Officer's Representative. Subject: Request for Incident Report - TNT Mix Acid Loss of 5 June 1973. June 13.

SPIL02 Cuniff, R.E., Plant Manager Uniroyal, Inc. 1973. Memorandum to William S. Rosing, LTC Contracting Officer's Representative. Subject: Pollution Summary for August 1973 - Significant Spills. September 5.

SPIL03 Cuniff, R.E., Plant Manager Uniroyal, Inc. 1974. Memorandum to William S. Rosing, LTC Contracting Officer's Representative. Subject: Pollution Summary for December 1973 - Significant Spills. January 9.

SPIL04 Cuniff, R.E., Plant Manager Uniroyal, Inc. 1974. Memorandum to William S. Rosing, LTC Contracting Officer's Representative. Subject: Pollution Summary for February 1974 - Significant Spills. March 5.

SPIL05 Cuniff, R.E., Plant Manager Uniroyal, Inc. 1974. Memorandum to William S. Rosing, LTC Contracting Officer's Representative. Subject: Pollution Summary for May 1974 - Significant Spills. June 3.

SPIL06 Cuniff, R.E., Plant Manager Uniroyal, Inc. 1975. Memorandum to William S. Rosing, LTC Contracting Officer's Representative. Subject: Pollution Summary for December 1974 - Significant Spills. January 3.

STCI01 Stanley Consultants, Inc. 1980. Final Review Copy Specifications for Construction of Joliet Army Ammunition Plant, Joliet, Illinois, Sanitary Waste System MFG. FY-80 MCA PN 46 prepared for U.S. Army Engineer District, Omaha Corps of Engineers, Omaha, Nebraska. December.

STCI02 Stanley Consultants, Inc. Interim Report Industrial/Sanitary Waste System Study, Joliet Army Ammunition Plant, Illinois.

TDSY01 Talley Defense Systems. 1988. Safety Site Plan for M864 Baseburn Production Facility at Joliet Army Ammunition Plant. September 9.

TDSY02 Jacobson, Laurie, Talley Defense Systems, Inc. 1991. Inter-Office Memorandum to Douglas T. Thomas, Department of the Army. Subject: JOAAP Part B Permit Application. September 6.

THAM01 U.S. Army Toxic And Hazardous Materials Agency and Dames & Moore, 1988. Presentation to State of Illinois Environmental Protection Agency, Joliet Army Ammunition Plant, Manufacturing Area, Remedial Investigation. November 10.

THAM02 U.S. Army Toxic And Hazardous Materials Agency. 1983. Partial Trip Report of James T. Johnson, Jr. of USATHAMA 12-14 December 1983 to Monitor Red Water Lagoon Remedial Action Operations and Tour the Installation, 22 December

THAM03 U.S. Army Toxic And Hazardous Materials Agency. 1984. Partial Trip Report of James T. Johnson, Jr. of USATHAMA, 20-22 March to Detailed site reconnaissance of Phase I/II survey study areas and discussion of Red Water Lagoon Remedial Action (RWLRA) current funding problems. 28 March.

THAM04 York, R.J. Chief, Installation Restoration Division. 1989. Memorandum to Mary Ann Rondinella. U.S. Army Armament, Munitions and Chemical Command. Subject: Honeywell, Inc. Proposal to use Building 70-44 at Joliet Army Ammunition Plant. August 23.

TROB01 Thompson, Robert L. Senior Contract Administrator. 1990. Letter to Darryl Borelli. Subject: Addendum for Environmental Baseline Survey (EBS) Group 3, Joliet Army Ammunition Plant, February 20.

TRWI01 Transportation and Environmental Operations of TRW, Inc. 1974. Report on an In-Depth Pollution Survey at Joliet Army Ammunition Plant. August.

UACC01 Mariah Associates, Inc. 1995. A Systemic Study of Air Combat Command Cold War Material Culture Volume I: Historic Context and Methodology for Assessment. Prepared for the U.S Air Force Air Combat Command. December.

UCCI01 Uniroyal Chemical Company, Inc., 1990. Spill Prevention Control and Countermeasure Plan and Installation Spill Contingency for Joliet Army Ammunition Plant, February 28.

UCCI02 Uniroyal Chemical Company, Inc., 1993 "PCB Testing of Equipment for Joliet Army Ammunition Plant".

UCCI03 Uniroyal Chemical Company, Inc. 1967. Industrial Lessee's Safety & Procedure Conference, July 18.

UCCI04 Uniroyal Chemical Company, Inc. 1993. Standard Operating Procedure for Demolition of Joliet Army Ammunition Plant, Joliet, Illinois. August 31.

UCCI05 Uniroyal Chemical Company, Inc. 1959. Written Standard Practice Maintenance & Power Department Joliet Army Ammunition Plant, Joliet, Illinois. June 25.

UCCI06 Uniroyal Chemical Company, Inc. 1970. Written Standard Practice Maintenance & Power Department Joliet Army Ammunition Plant, Joliet, Illinois. May 12.

UCCI07 Uniroyal Chemical Company, Inc. 1970. Written Standard Practice Safety Department Joliet Army Ammunition Plant, Joliet, Illinois. December 2.

UCCI08 Uniroyal Chemical Company, Inc. 1970. Written Standard Practice Munitions Department Joliet Army Ammunition Plant, Joliet, Illinois. December 2.

UCCI09 Miller, R.J. Plant Manager. 1975. Letters to Jack F. Calvert, Contracting Officer's Representative. Subject Pollution Summary for January 1975 - March 1976, Significant Spills - JOAAP.

UCCI10 Uniroyal Chemical Company, Inc. 1972. Final Report Sellite Pilot Aeration and Neutralization Process, Project # AMCMS 4932-05-4114-0-02 Uniroyal, Inc. Joliet Army Ammunition Plant. November.

UCCI11 Uniroyal Chemical Company, Inc. Manual of Standard Operating Procedures for South Filtration Plant.

UCCI12 Uniroyal Chemical Company, Inc. Phase I Report Process Water Management Study Project # AMC 5724114-00 Joliet Army Ammunition Plant, Joliet. Illinois.

UCCI13 Fielding, R.T., Area Safety Engineer, 1971. Memorandum to H.S. Hennard. Subject: Empty Propellant Drums. May 11.

UCCI14 Cunniff, R.E., Plant Manager, and Parker, R.F., Director, 1972. Memorandum to Jerry Melito. Subject: Red Water in Desplaines River. August 17.

UCCI15 Doherty, L.A., Factory Manager, and Miller, R.J., Asst. Technical Supt., 1966. Memorandum to William E. Richards, Major OrdC. Subject: Prevention, Control and Abatement of Water Pollution by Federal Activities. April 20.

UCCI16 Cunniff, R.E., Plant Manager, and Desmarais, N.A., Chief Process Engineer, 1972. Memorandum to John D. Thomas, LTC, OrdC Commanding. Subject: Pollution Summary for January and February 1972-Significant Spills. February 7 and March 2.

UCCI17 Cunniff, R.E., Plant Manager, and Desmarais, N.A., Chief Process Engineer, 1972. Memorandum to Willis S. Rosing, LTC, OrdC Commanding. Subject: Pollution Summary for August 1972-Significant Spills. September 7.

UCCI18 Uniroyal Chemical Company, Inc. 1993. Preliminary Assessment Screening Statement of Findings Joliet Army Ammunition Plant, 10 Underground Storage Tanks (UST's). June 14.

UCCI19 Uniroyal Chemical Company, Inc. 1993. Preliminary Assessment Screening Joliet Army Ammunition Plant, Easement for Electrical Services. January 21.

UCCI20 Uniroyal Chemical Company, Inc. 1993. Environmental Assessment (EA) and Findings of No Significance for the Demolition of Group 60 Buildings. February 9.

UCCI21 Uniroyal Chemical Company, Inc. 1993. Preliminary Assessment Screening Joliet Army Ammunition Plant, Building 716-4. March 15.

UCCI22 Uniroyal Chemical Company, Inc. 1991. Preliminary Assessment Screening Joliet Army Ammunition Plant, Building 27-15. December 19.

UCCI23 Uniroyal Chemical Company, Inc. 1991. Preliminary Assessment Screening Joliet Army Ammunition Plant for Buildings 60-3, 60-4, 60-5, 60-7, 60-8, 60-9, 60-9A, 60-9B, 60-9C, 60-10, 60-13, 60-20 and 60-90. August 6.

UCCI24 Uniroyal Chemical Company, Inc. 1993. Preliminary Assessment Screening Joliet Army Ammunition Plant, Railroad Tracks. February 24.

UCCI25 Uniroyal Chemical Company, Inc. 1992. Preliminary Assessment Screening Joliet Army Ammunition Plant, Building 70-47 and 18 Acres of Land in the Group 70 Area. December 14.

UCCI26 Cunniff, R.F., Plant Manager, 1972. Memorandum to Jerry Melito, Chief Engineer. Subject: Description of the Joliet Army Ammunition Plant Tetryl Facilities. August 15.

UCCI27 Strauss, P.H., Finance Manager, 1991. Memorandum to Ms. Pat Muzzarelli. Subject: DA Form 37, Request for Approval of Disposal of Buildings and Improvements for Bldg. 703-1. June 17.

UCCI28 Uniroyal Chemical Company, Inc. 1991. Preliminary Assessment Screening Joliet Army Ammunition Plant for Building 718-2. July 11.

UCCI29 Thomas, W.A., Fire Protection Engineer Uniroyal Chemical Company, Inc. 1991. Letter to Ms. Lorie McCullum, Deputy Director Will Co. Subject: Worst Case Scenario Map. August 6.

UCCI30 Uniroyal Chemical Company, Inc. 1992. 1991 Hazardous Waste Report. February 24.

UCCI31 Miller, R.J., Plant Manager, 1978. Memorandum to U.S. Environmental Protection Agency Office of Toxic Substances. Subject: Toxic Substances Control Act (TSCA). May 1.

UCCI32 Kucharz, Stanley W., Contracting Officer's Representative, 1977. Letter to Mr. R.J. Miller, Plant Manager Uniroyal, Inc. Subject: Unauthorized Dumping Area. October 21.

UCCI33 Miller, H.R., Safety Superintendent Uniroyal, 1985. Memorandum to T.L. Erdman. Subject: Toxic Substance Disclosure to Employee Act. June 26.

UCCI34 Forsythe, F.J., Safety Superintendent Uniroyal, Inc. 1991. Memorandum to Mr. Thomas L. Erdman, Acting Commander's Representative. Subject: Hydraulic Oil Spills at Vehicle Gate #4 LAP Unit. August 29.

UCCI35 Uniroyal Chemical Company, Inc. 1970. Standard Operating Procedures. - Tetryl De-Activation, Joliet Army Ammunition Plant. December 11.

UCCI36 Uniroyal Chemical Company, Inc. 1972. Explosive Department - TNT Operation, Standing Operating Procedure for E-63-A - Deactivation of DNT Sweating and Graining House and Equipment. November 14.

UCCI37 Uniroyal Chemical Company, Inc. 1977. Explosive Department - Acid Operation, Standing Procedure for the Transfer of Liquid Propane from Plant Storage to Either Transport Truck or Tank Car. September 22.

UCCI38 Uniroyal Chemical Company, Inc. 1977. Explosive Department - Prod. Control Section, Standing Operating Procedure for the Accountability of Explosives and Contaminated Waste Within the Continuous Process. February 10.

UCCI39 Uniroyal Chemical Company, Inc. 1969. Maintenance and Power Department, Power Division Standing Operating Procedures. November 13.

UCCI40 Blanchard, K.P., Maintenance & Power Manager, 1991. Memorandum to Douglas J. Thompson, Contracting Officer's Representative. Subject: Notification of Environmental Compliance Review. February 26.

UCCI41 Uniroyal Chemical Company, Inc. 1980. General Standard Operating Procedures's, Munitions, Burning Grounds, Burning Pads, Demolition 90 mm M-71 HE, Inspection Magazines and Warehouses, Demolition Lead Azide Facilities, Survey. January 1.

UCCI42 Uniroyal Chemical Company, Inc. 1969. Material Department, Railroad, Automotive, Magazine Sections, Standard Operating Procedure for the Cleaning of Explosive Contaminants from Mobile Equipment In Use by the Materials Department. August.

UCCI43 Uniroyal Chemical Company, Inc. 1969. Building and Facility Information. June 30.

UCCI44 Uniroyal Chemical Company, Inc. 1967. Standard Engineering Procedures. December 7.

UCCI45 Uniroyal Chemical Company, Inc. 1973. Standard Operating Procedure Materials Department Automotive Section. June 8.

UCCI46 Uniroyal Chemical Company, Inc. 1966. Technical Instructions for Maintenance of Production Equipment for Major Road Lines. November 29.

UCCI47 Uniroyal Chemical Company, Inc. 1968. Isomer and By-Products in the Production of TNT. May.

UCCI48 Uniroyal Chemical Company, Inc. Lead Azide Training Manual.

UCCI49 Health Physics Associates LTD, Report Of Radiation Survey Group 3, Certificate of Calibration, prepared for Uniroyal Chemical Company, Inc.

UCCI50 Health Physics Associates Ltd. 1969. Report of Radiation Survey Group 1 and Group 3, Joliet Army Ammunition Center. June 9.

UCCI51 Health Physics Associates Ltd. 1967. Radiation Survey Report Group 2, Joliet Army Ammunition Depot. June 8.

UCCI52 Health Physics Associates Ltd. 1968. Report of Radiation Protection Survey Group 3A and Group 4. January 26.

UCCI53 Fielding, R.T., Safety Supervisor, 1968. Memorandum to G.T. Carpenter. Subject: Threaded Fittings on Condensate Lines. August 23.

UCCI54 Schmincke, J.C., Investigator Plant Protection, 1973. Memorandum to D.R. Thomas, Superintendent Plant Protection. Subject: Report of Investigation Pertaining to Report of Trespassing, Fire, and Vandalism at JOAAP Alum Plant Located on the DesPlaines River Approx. 1/4 mile West of the North River Pump House - Building 412-2. April 20.

UCCI55 Burruss, H.L., Senior Technical Assistant, 1985. Memorandum to B.J. Gorden. Subject: Environmental Assessment and Finding of No Significant Impact for Excessing of Certain Buildings in Group 61. August 8.

UCCI56 Strauss, P.H., Finance Manager, 1993. Memorandum to Ms. Pat Muzzarelli, Department of the Army. Subject: Removal of Underground Storage Tanks. August 19.

UCCI57 Troyer, B.D., Project Engineer, 1981. Memorandum to B.J. Gorden. Subject: Underground Storage Tanks. January 28.

UCCI58 Desmarais, N.A., Maintenance and Power Manager, 1985. Memorandum to Douglas J. Thompson, Contracting Officer's Representative. Subject: RCRA Amended Part "A" Permit. January 22.

UCCI59 Uniroyal Chemical Company, 1967. Area Plots for Joliet Army Ammunition Plant. April 15.

UCCI60 Desmarais, N.A., Maintenance and Power Manager, Uniroyal, Inc. 1980. Memorandum to Mr. F.J. Forsythe, Contracting Officer's Representative. Subject: MCA Projects LI-40 and LI-46 for FY-80 Program. January 8.

UCCI61 Cunniff, R.E., Plant Manager, Uniroyal, Inc. 1971. Memorandum to John D. Thomas, LTC, OrdC, Contracting Officer's Representative. Subject: Explosive Wastes at the Burning Grounds. October 7.

UCCI62 Dewey, C.M. and Schmucker, J.P., Industrial Engineering Department, Uniroyal, Inc. 1969. Memorandum to C.A. Bond. Subject: Results of the Trial Movement of All Non-Contaminated Waste to the Munitions Burning Grounds. December 19.

UCCI63 Schmucker, J.P., Industrial Engineers Department, Uniroyal, Inc. 1969. Memorandum to H. Miller, H. Woodhouse, and W. Neal. Subject: Implementation of a 1-week trial commencing December 8 on relocating the Explosives Garbage Burning Operations to the Munitions Burning Grounds. December 1.

UCCI64 Parker, R.F., Director Engineering and Planning, Uniroyal, Inc. 1970. Memorandum to Charles F. Ball, Jr., LTC OrdC Contracting Officer's Representative. Subject: Opening Burning of Propellants and Explosives. August 7.

UCCI65 Dewey, C.M. and Schmucker, J.P., Industrial Engineering Department, Uniroyal, Inc. 1969. Memorandum to E.S. Muller. Subject: Analysis of the Explosives Flashing Grounds. September 17.

UCCI66 Kelman, H.I., Industrial Engineering Department, Uniroyal, Inc. 1968. Memorandum to S. Moskowitz. Subject: Amount of Trash Sent to Burning Grounds Daily. August 21.

UCCI67 Woodhouse, H.F, Safety and Surveillance Supervisor, Uniroyal U.S. Rubber Company, 1967. Memorandum to V. Russo. Subject: Combustible Trash Disposal. January 24.

UCCI68 Doherty, L.A., Uniroyal, Inc. 1970. Details of Reported Burning Grounds Activities from June 11, 1969 to May 12, 1970. May 12.

UCCI69 Blanchard, K.P., Maintenance & Power Manager Uniroyal Chemical, 1992. Memorandum to Commander Joliet Army Ammunition Plant. Subject: Removal of Underground Storage Tanks. September 15.

UCCI70 Miller, R.J., Plant Manager Uniroyal, Inc. 1974. Memorandum to William S. Rosing, LTC Contracting Officer's Representative. Subject: Schedule of Compliance, Report of Progress, Discharge Permits. July 1.

UCCI71 Miller, R.J., Plant Manager Uniroyal, Inc. 1984. Memorandum to Douglas J. Thompson, Contracting Officer's Representative. Subject: Combined Sewer Systems, GOCO Plants. December 6.

UCCI72 Miller, R.J., Plant Manager Uniroyal, Inc. 1978. Memorandum to Stanley W. Kucharz, Contracting Officer's Representative. Subject: Industrial Hygiene Survey (IS) Number 66-0249-78. February 9.

UCCI73 Miller, R.J., Plant Manager Uniroyal, Inc. 1978. Memorandum to Stanley W. Kucharz, Contracting Officer's Representative. Subject: PDB-I MCA FY-81, T-04500 Sellite Industrial Waste Treatment. January 23.

UCCI74 Miller, R.J., Plant Manager Uniroyal, Inc. 1972. Memorandum to Willis S. Rosing, Contracting Officer's Representative. Subject: Industrial Hygiene Survey (IS) Report Number 35-0008-72. May 9.

UCCI75 Uniroyal, Inc. 1970. Inspection Forms for the Review of Waste Water Disposal at Federal Installations. Joliet Army Ammunition Plant. June 8.

UCCI76 Miller, R.J., Plant Manager Uniroyal, Inc. 1970. Memorandum to John D. Thomas, LTC Contracting Officer's Representative. Subject: Report of Explosives Safety Survey of Joliet Army Ammunition Plant, Joliet, Illinois. December 3.

UCCI77 Parker, R.F., Technical Superintendent, 1966. Memorandum to William E. Richards, Major OrdC, Contracting Officer's Representative. Subject: Stream Pollution Testing and Control Program. May 2.

UCCI78 Uniroyal, 1972. Joliet Army Ammunition Plant Master Safety Program Fiscal Year 1972.

UCCI79 Shrode, M., Chief Inspector Quality Control, 1971. Memorandum to N. Drenten. Subject: Re-sample for Test Firing of Lot JA-16-113. March 31.

UHDE01 Hoechst-UHDE Corporation. Technical Data Book for Joliet Army Ammunition Plant New Acid Area, D.S.N. Acid Unit Joliet, Illinois.

UNKN01 Unknown author, 1995. Installation Action Plan for Joliet Army Ammunition Plant (JOAAP), June 12.

UNUR01 Uniroyal Chemical Company, Inc. 1971-78. Explosives Department Unusual Incident Reports.

USDE01 U.S. Department of Energy, 1994. Uptake of Explosives from Contaminated Soil by Existing Vegetation at the Joliet Army Ammunition Plant, ANL/ESD/TM-65. January.

USOP01 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1973. Explosives Department - TNT Operation, Standing Operating Procedure for the E-63 - Bi-Nitration. December 12.

USOP02 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1973. Explosives Department - TNT Operation, Standing Operating Procedure for the E-63 Mono-Nitration. March 5.

USOP03 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1973. Explosives Department - TNT Operation, Standing Operating Procedure for E-63 Tri-Nitration. December 12.

USOP04 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - TNT Operation, Standing Operating Procedure for E-68 - Tetryl Packing House and E-68 - Tetryl Shipping House. July 28.

USOP05 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - TNT Operation, Standing Operating Procedure for E-68 - Tetryl Nitrator Building. May 5.

USOP06 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1977. Explosives Department - TNT Operation, Standing Operating Procedure for Acid Fume Recovery and Incinerator/Boiler System. April 1.

USOP07 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1976. Explosives Department - TNT Operation, Standing Operating Procedure for Nitration and Purification. March 2.

USOP08 Chemical Construction Corporation, 1972. Description of Operations, Acid Recovery and Fume Abatement Plants at Joliet Army Ammunition Plant, Joliet Illinois. December.

USOP09 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - TNT Operation, Standing Operating Procedure for E-63 - Shutdowns - Emergency and Weekend. November 17.

USOP10 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - Tetryl Operation, Standing Operating Procedure for E-68 - Tetryl Nitrator Building. May 5.

USOP11 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1973. Explosives Department - TNT Operation, Standing Operating Procedure for E-68 - Tetryl Shutdowns - Emergency and Weekend. February 2.

USOP12 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1966. Explosives Department -Standing Operating Procedure for the Red Water Plant Including Acids, Oil and Raw Materials Handling. March 1.

USOP13 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - TNT Operation, Standing Operating Procedure for E-63 - Waste Acid and Fume Recovery. November 13.

USOP14 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - Tetryl Operation, Standing Operating Procedure for E-68 - Tetryl Sulfator Building. May 19.

USOP15 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - Tetryl Operation, Standing Operating Procedure for E-68 - Dry House. July 14.

USOP16 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1972. Explosives Department - DNT Operation, Standing Operating Procedure for E-63A - DNT Sweating and Graining House. April 21.

USOP17 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1967. Explosives Department - TNT Operation, Standing Operating Procedure for Manufacturing of TNT. January 3.

USOP18 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit. Explosives Department - Interim Standing Operating Procedure for E-62 Material Transfer Operation, Loading Toluene Tank Trucks.

USOP19 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1977. Explosives Department - TNT Operation, Standing Operating Procedure for DDC Control Room and Nitration and Purification Building. August 31.

USOP20 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1973. Explosives Department - Tetryl Operation, Standing Operating Procedure for E-68 Tetryl Line Deactivation. February 9.

USOP21 United States Rubber Company, Joliet Army Ammunition Plant, 1966. Acid Department, Standing Operating Procedure for Nitric Acid Concentrating Buildings. August 25.

USOP22 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit, 1973. Explosives Department - DNT Operation, Standing Operating Procedure for Manufacture of DNT. April 24.

USOP23 Uniroyal Chemical, Division of Uniroyal Inc. Joliet Army Ammunition Plant Manufacturing Unit. Asbestos Putty Operation - Operating Rules.

USOP24 Uniroyal Chemical Company. Standing Operating Procedure for Burning Propellant Powder (Bulk or in Loose Propelling Charges).

USOP25 Uniroyal Chemical Company. Standing Operating Procedures for Burning Contaminated Liners from TNT Boxes.

USOP26 Uniroyal Chemical Company. Standing Operating Procedures for Burning of Inert Trash.

USOP27 Uniroyal Chemical Company, 1971. Standing Operating Procedures for Igniting of Burning Pads and Inert Pits. November 24.

USOP28 Uniroyal Chemical Company, 1972. Standing Operating Procedures for Burning Bulk Comp B. July 25.

USRC01 U.S. Rubber Company, 1955. Joliet Arsenal Kankakee Unit Acid Department Tank Capacities. June 13.

WDEP01 War Department. 1942. Report of Proceedings of Board of Officers; subject: Investigation of the explosion which occurred on June 5, 1942 Elwood Ordnance Works. June 8.

WDEP02 War Department 1942. Report of Proceedings of Board of Officers; subject: Investigation and Recommendations concerning an explosion which occurred on August 19, 1942 in the Bi-Fortifier of Line 1, TNT Kankakee Ordnance Works. November 20.

WDEP03 War Department 1942. Report of Proceedings of Board of Officers; subject: Investigation and Recommendations concerning an explosion which occurred on August 19, 1942 in the Bi-Fortifer of Line 1, TNT, Kankakee Ordnance Works. December 5.

WDEP04 U.S. Engineers Office, 1944. War Department Industrial Facilities Inventory Elwood Ordnance Plant. May 15.

6.0 BIBLIOGRAPHY

WEST01 Roy F. Weston, Inc. 1995. Confirmatory Soil Screening Survey Report Joliet Army Ammunition Plant Joliet, Illinois. October.

WWCC01 Woodward-Clyde Consultants, 1985. An Archeological Overview and Management Plan for the Joliet Army Ammunition Plant, Will County, Illinois. March 4.